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THE JOURNAL OF
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PROBLEMS IN THE SCIENTIFIC STUDY OF THE TEACHING OF ARITHMETIC.

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INTRODUCTORY STATEMENT.

An exhaustive treatment of this subject would go far beyond the limits of this paper. It would indicate means of securing full answers to the two questions:

1. *What arithmetic ought to be taught?*
2. *How can this arithmetic be taught best?*

The main part of the present paper will be given to indicating ways of determining the relative values of the more obviously conflicting practices and opinions concerning the present teaching of the subject. An outline will also be given of what an exhaustive study would include. Most classroom teachers and others not interested in the more technical parts of the article will doubtless wish to turn immediately to Part II.

It will be seen that, as stated above, the first of the two questions is fundamental. Doubtless a large majority of the questions most available for scientific study lie in the field of conflicting methods. *How to teach* immediately gives grounds for differences of opinion. Testing hypotheses is one phase of science. It is important that these studies be pushed forward, but it is even more important that the question of *what to teach* be scientifically investigated. Much study has been devoted to this question in recent years, and to its results may be attributed many omissions of obsolete subject-matter.

Further and more accurate studies will doubtless show that still other subject-matter can be safely omitted, and thus the need of investigating the relative values of conflicting methods of teaching certain topics will be eliminated, *e. g.*, if it is shown that fractions whose common denominator cannot be determined by inspection have no place in the subject-matter of arithmetic, there will be no need of a scientific study to determine the degree to which it pays to explain the processes of reducing to a common denominator.

If, then, an investigator wishes to be certain that his study is entirely fundamental, he must either work in the field of the first of the above-stated questions or select such phases of the second question as are certain not to be eliminated by investigations in the field of the first question. Otherwise, he may find that he is 'hitting at a straw man.'

I. What Ought to Be the Subject-Matter of Arithmetic?

Much progress has been made in answering this question by applying the criterion of utility to the various topics of arithmetic. But up to the present time comparatively little thoroughly scientific work has been done in the field.

Then, too, it is rightly felt that ultilitarianism is not the only standard for judging the worth of subject-matter.

Following others, Professor Smith has classified the values of arithmetic as *practical* and *cultural*.[1] There are, then, two phases of the question, viz.: the practical one, *What Arithmetic is needed in order best to make a living?* and the cultural one, *What Arithmetic is needed in order to make the best living?*

The answer to the practical phase is found in the study of the values of the subject as an instrument of economic welfare; and the answer to the cultural phase is found in the study of the values of the subject as an instrument of mental development. The one phase is mainly sociological, the other mainly psychological. The answer to the sociological phase is being found in social ife; the answer to the psychological in mental life. The one is a problem in educational sociology; the other a problem in educational psychology.

[1] *The Teaching of Elementary Mathematics*, New York, 1900; also *The Teaching of Arithmetic*, New York, 1909, both by David Eugene Smith.

The Practical or Sociological Phase.

An adequate answer to the sociological phase must be based on a full knowledge of the values of arithmetic in the economic and other social needs of life. Its field is largely that of the economic activities; but it also includes all social activities in which arithmetic functions, *e. g.*, games, travel for recreation or culture, etc.

Some of the phases of this question are:

1. *What minimum of arithmetic is needed by all people in the economic activities of life?* This must be taught to all boys and girls.

2. *To what relative degrees are the respective topics in the irreducible minimum used? e. g.*, How much more often is addition needed than division; decimal fractions to thousandths than to millionths, 10 per cent. discount than 6 per cent. interest, etc.?

3. *What is the minimum of arithmetic needed by all people for the play and other recreative activities of life?* This ought to be taught to all boys and girls.

4. *What additional arithmetic is needed in the respective trades and professions?* This inquiry should include the preparatory values as well as the intrinsic values of the subject, *i. e.*, it should show what arithmetic is needed as a preparation for other subjects used in the respective vocations as well as what arithmetic is needed for following these vocations. In this connection the inquiry should answer such questions as, *What arithmetic is needed as a preparation for the algebra that is required by civil engineers?*[2]

Whatever additional arithmetic is found essential to success in the respective trades and professions should be taught to those entering these walks of life.

The 'Cultural' or Psychological Phase.

The adequate treatment of the psychological phase of the question must be based on a full knowledge of the values of arithmetic in the mental aspects of life. This is the question of the *mental discipline* values of the subjects.[3]

---

[2]Compare problem 7 under cultural phases of the question.

[3]Certain phases of this problem seem at present impossible of exact solution. Methods and means of attack are lacking. Psychological and statistical research have not yet developed sufficiently to make full investigation possible; but it is none the less important that we face the question.

Some of the problems in this question which need scientific study are:

1. *What disciplinary values has arithmetic that are peculiar to the subject?* The answer to this question will tell whether the subject has distinctively 'cultural' values.

2. *What of the peculiarly disciplinary values of this subject are needed in all walks of life?* These must be attained by all boys and girls of normal ability.

3. *What additional disciplinary values are needed in the respective trades and professions?* These should be attained by those entering these respective walks of life.

4. *What arithmetic help is needed by the developing child to best further the respective stages of his growth? i. e.,* What are the instinctive number needs of the various stages of child development? It may be found that the answer to this question is identical with or included in the answers to the sociological questions; but the importance of adequate provision for development makes it imperative that the matter be studied from the standpoint of *nurture.* We need to know what arithmetical stimulii are needed as mental food as well as what arithmetical abilities are needed to meet the practical and cultural demands.

A case in point is that of the arithmetical aspects of children's play. At present it is probably safe to say that the vast majority of even the best teaching regards the play tendency as a means of teaching certain prescribed arithmetic instead of regarding the arithmetic as a means of promoting the growth of certain desirable play tendencies. It is evident that from the standpoint of education as growth much of even the better teaching is probably open to severe criticism. Thus it is seen that this problem is large, far-reaching, and well worthy of thorough investigation.

5. *At what approximate ages are these stages reached, and what are their manifestations? i. e.,* When are the majority of children by reason of inner growth most ready to benefit by the respective phases of arithmetic?

6. *At what age should those number operations for which there is probably no marked instinctive need be taught? e. g.,* long division is a topic for which few children seem to have

any marked instinctive need, and it is usually placed in the fourth grade. If scientific study shows that there is no marked instinctive need which this topic satisfies at any stage of development, is the fourth grade or some other the best grade in which to teach this topic?

The answers to these last three questions will have large bearing on the arrangement of the course of study. They will give direct help in the distribution of arithmetic subject-matter among the various grades, both as to time allotment and as to the order in which topics are best taught.

7. *To what extent is the discipline of the respective parts of arithmetic transferable?*[4] This question is pertinent from two standpoints, viz.: the transferability of discipline from arithmetic to other subjects,[5] and the transferability of discipline from one topic in arithmetic to another topic in that subject.

II. How Can the Subject-Matter of Arithmetic Be Taught Best?

This is the question of *Methods* in the broad sense of that much-used word. It is the question of *how* as opposed to *what*. Given a certain subject-matter to be taught, the scientific study concerns itself with determining which of two or more procedures or methods is the better or the best. In the broad sense in which the term is used here, it will be found to include such factors as *supervision of teaching* and the *time allotment* for the subject.

The list of questions or phases of the large question of methods as stated below is far from complete. It aims to be suggestive rather than comprehensive. The data for the answers to a great majority of the questions as listed may be found in current practice.

What the Individual Teacher Can Do. Whatever is done in teaching or in the study of teaching depends in the last analysis on the teacher. It is the results of actual teaching that count. It is products rather than plans for products that must be measured. Scientific study is, therefore, in a very

[4]Compare last part of problem 4 under practical phases of the question.
[5]Much good work has been done on this problem, but more is needed.

fundamental way, dependent on the work of classroom teachers. Fortunately, there are many teachers today who have strong and clear-cut convictions about methods of teaching, and many of these teachers are able to put their ideas into practice.

That equally bright and capable teachers differ fundamentally in their methods merely shows the stage of education as a science. What scientific study must do is to evaluate these various methods.

Individual teachers can do much. The greatest thing for them to do is to get a good method of procedure clearly defined, follow it consistently and then get its results adequately evaluated. This evaluation will ordinarily be best made by a trained investigator; but teachers are rapidly finding that they do not need to wait for a trained investigator. The requisites for evaluation are: data to be evaluated, units of measurement, defined conditions for using these units and standards for comparing results. Fortunately, standardized tests[6] are rapidly becoming available in such form that the class teacher can readily utilize them without special psychological or statistical training.[7]

Ideal Conditions for Scientific Study. The best conditions for scientific study are those in which teachers and special investigators co-operate. The investigator may be superintendent, supervisor, principal or some person from outside the

[6]The tests of Mr. Courtis are doubtless the best available. They afford means of measuring and interpreting results in the four fundamental operations and in simple reasoning.—S. A. Courtis, Detroit, Mich.

[7]Teachers should also employ standardized tests for another purpose, viz.: that of determining the needs and progress of their pupils. How much does my class need to improve? Compared with what other boys and girls of the same age and grade are doing, how well do mine do? How well do they add, subtract, etc.? These are questions that every teacher wants to answer. Happily she can now get definite answers and compare them with definite standards. Adequate testing at the beginning of a term shows where the class stands as a class, and where the pupils stand as individuals. The teacher then can plan to meet class and individual needs. At about the middle of the year or term the tests should be repeated and progress noted. This will form the best basis for further teaching, and then, at the end of the year, a third testing should be made to measure the year's gains. Then this same teacher may well see to it that these same pupils are tested at the opening of the following year and note vacation losses.

To summarize, then, every teacher, whether she is following a particular or unique method or not, can and should utilize tests to determine needs at the opening of the year or term, to determine progress during the year or term, and to measure losses during vacation.

system, but whoever he is, he must have the co-operation of the class teachers. The class teachers must follow the methods definitely and accurately, and then submit the results to measurement, regardless of their personal opinions; the investigator must measure precisely and adequately, then evaluate the results, regardless of his preconceived beliefs. The larger the number of measurements, the more conclusive the results; hence the desirability of wide co-operation.

Two Main Sources of Data. There are two main sources from which data may be secured for the evaluation of different methods, viz.: measurements of current practices and measurements of specifically controlled practices or procedures. Much teaching is today so clearly committed to definite methods that measuring the results of selected types of current practice would go far toward evaluating such methods. A case in point is that of teaching subtraction by the so-called Austrian or 'making change' method and by the common or 'taking away' method. The staunch advocates of each are at work. Why not measure and evaluate these methods? Another case is that of rationalizing such operations as carrying, borrowing, placing partial products, etc. Rationalizing is being done in varying degrees. Why not select an adequate number of pupils definitely taught each way, measure their abilities and then evaluate the methods?

Many Factors Combine to Determine Abilities. It may be objected that there are many other factors that determine abilities besides that of method, and merely to test pupils that have been taught according to given methods might not prove much about the relative value of these methods, because of the intermingling of the various factors. This contention would be true if there were not enough systems of schools tested so that the variation in the other factors would be equalized. Every investigator should take full account of all the factors contributing to the product measured. The chief factors that determine arithmetical abilities are:

Capability of learners
Efficiency of teachers
Methods of teaching
Supervision
Time allotments
The course of study.

Rarely, if ever, are all the factors, except the one being tested, found operating equally in different systems of schools. Hence the need of testing the pupils in a sufficient number of systems so that differences in the other factors will equalize each other. But even with a very large number of systems tested, this is always an element of doubt; hence the controlled procedure is desirable before final conclusions are reached.

The following sketch of a problem and a method of securing data by a controlled procedure will serve to illustrate the use of this means of getting help in the scientific solution of a problem of teaching.

A Problem and a Suggested Method of Securing Data by a Controlled Procedure: *Oral or Mental vs. Written Arithmetic.* How much of the work should be oral rather than written? How ought the time to be divided between written and non-written work? Obviously the answer to this question will depend on many factors and differ with different topics. At present there is no guide except opinion. Any teacher can make a beginning toward answering the question by systematically carrying out well-laid plans and measuring results.

The question could probably be most readily studied by a single teacher or group of teachers in departmental teaching, though a teacher of one grade can divide her class into two groups, equal as to arithmetical ability, and do much toward answering the question.[8]

In planning for a 'controlled practice' great care should be taken to equalize all factors save the one to be tested. Uniformity should be followed by all teachers in all such matters as amount of home work, individual coaching, the handling of written work, use of incentives, etc.

To state a method of controlled procedure in some detail, the pupils should be divided so that about equal capabilities

[8]Teachers often hesitate to work with pupils under what seems to them extreme conditions, thinking that anything in the nature of a departure is an experiment, and therefore dangerous. This hesitation is not usually justified, for even if results show that some groups have been somewhat at a disadvantage, it can be made up to them very readily after the controlled testing is completed. It will be noted that here, as elsewhere in this discussion, the word *experiment* is not used. This is done because the word has come to suggest something radical, dangerous, and therefore to be avoided.

exist on each side; then an agreement should be entered into and kept as to the apportionments of time for each of the groups concerned. Supposing there be 45 minutes daily recitation, one group might agree to devote 15 minutes per day to oral and 30 minutes to written, another 10 to oral and 35 to written, another 30 to oral and 15 to written work. After all groups have worked a given number of days on a given topic, *e. g.*, simple interest by 6 per cent. method, all three groups should be tested. Let the tests be thoroughly adequate. The problems for the tests might well be drawn from several sources. One set might well be agreed upon by the teachers of the respective groups, another selected by the superintendent or other co-operating investigators, and another might well be drawn from the actual current business practices of the community.

Absolute uniformity as to time allowed for tests, directions to pupils, etc., should be maintained, and to this end it is essential that some one person equally strange or equally well known to all the children give all the tests. Teachers, principals and all others should refrain absolutely from participating in any way.

It is best to have tests and directions printed. For this will minimize such factors as differences of accessibility of blackboard writing, dangers of not being understood in oral statements, etc.

An adequate measuring of results would require tests at several intervals after the teaching. One thorough testing should be made at the close of the teaching of the topic. This would indicate the relative potency of the respective methods in producing immediate results. Another thorough testing should be made after an interval of about a month, and another at perhaps the end of a year. The later testings are needed as a means of comparing the methods for the degree in which they enable pupils to retain the results of teaching.

Typical Problems in Teaching.

As stated above, this list of problems in methods is only partial.[9] For the most part, the suggestive questions have

[9]For certain others and a more extended discussion of some of these, see Smith and Suzzallo, Chapters XIII and XIV, Smith's *Teaching of Arithmetic;* also Courtis in his Folders and various articles.

been grouped under the familiar divisions of arithmetic. To some teachers and investigators the stating of certain of these questions as problems for study will seem like 'setting up straw men.' But the writer believes that all the alternatives exist in practice, and if scientific investigation can help to knock down what ought to be straw men, so much the better for science and investigation.

In Addition.

1. What is the relative difficulty of the combinations?
2. Which is better, to add one number after another or to add by groups? *i. e.*, in adding 1 plus 2, plus 8, plus 9, should children be taught to think 3, 11, 20; or should they be taught to think 2 plus 8 equal 10, 9 plus 1 equal 10, 20?[10]
3. Which is better, to teach the addition combinations above 10 (sums above 10) concretely as the combinations below 10 are taught, or to master all addition and subtraction combinations below 10 and then find the combinations above 10 by taking from one addend enough to add to the other to make 10?[11]
4. Which is better, to add up or down the columns?
5. Does it pay to write down the numbers to carry?

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[10]It must be constantly kept in mind in investigating this question, as in all others herein stated, that conclusions must be reached first of all concerning class or mass teaching. Questions of individual treatment, allowing for individual initiative, etc., are important, and should receive due attention, but research in teaching should concern itself first of all with problems from the standpoint of class presentation. With more specific reference to the above-stated problem in the teaching of addition, there is no doubt that some children will and should add by grouping into tens. No doubt these pupils should be encouraged as individuals, and there is equally no doubt that in business schools other than the one-after-another addition should be taught.

Future mathematicians and future accountants and others with some cleverness in handling numbers there will and ought to be in practically every class; the short cuts that the genius of these pupils prompts them to use ought to be welcomed; but there will and also ought to be many other pupils who have no particular genius for handling numbers—many of the future professional men and women, the future working men and women, and the future housewives.

Hence the question as here stated refers to the best way of *presenting* column addition to the great body of boys and girls, *i. e.*, to its presentation to 'all the children of all the people' in public elementary schools.

[11]See Stone-Millis Primary Arithmetic, pages 21, 22, 23. E. g. $\begin{matrix}6\\+9\end{matrix} = \begin{matrix}5\\+10\end{matrix}$

6. Which is better, to teach addition combinations and their reverses in association or separately?[12]

7. Which is the better *check* on errors, adding the same direction again or reversing, *i. e.*, if one has added up, is it better to add up again or add down for the check or so-called proof?

In Subtraction.

1. Which is better, the method variously named Austrian, making change and addition, or the one usually called the taking away method?[13]

2. If the borrowing method is used, which is better, to explain the basis for borrowing or to proceed at once to making the operaton habitual?

3. Does it pay to change the figures in the minuend while pupils are learning the *borrowing* method?

4. Which is the better proof, to add subtrahend and difference or to repeat the subtraction?

In Multiplication.

1. What is the relative difficulty of the multiplication tables and of the individual combinations?

2. Which is the best order in which to teach the tables, and what is the best form in which to write them?

3. To what extent should the reasons for the correct placing of the partial products be explained?

4. Which is the better check on multiplication, casting out nines or dividing the product by one of the factors?

5. How valuable are such explanatory algorisms as those illustrated by Professor Smith in his *Teaching of Arithmetic*, page 94?

In Division.

1. Which is better, to teach the division tables as new tables or to employ the so-called Austrian or multiplication method?

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[12]For extended discussion, see Smith and Suzzallo in the *Teaching of Arithmetic*, pages 58-60.

[13]Conclusions as to this problem must, of course, include the effect which work by the addition method would have on addition ability.

2. To what extent should the teacher attempt to rationalize the processes of division through explanation?[14]

3. To what extent are such explanatory or 'accessory algorisms' as those given by Professor Smith on page 95 of his *Teaching of Arithmetic* of value?

4. How essential is it that the so-called partition 'case' of division receive special attention?

5. Which is the better proof of division, multiplying the quotient by the divisor or casting out nines?

In Fractions.

1. Which is better, to teach common fractions or decimal fractions first?

2. What are the objections to handling all fractional parts except halves, fourths, thirds and sixths in decimal form?

(a) What, if any, schoolroom needs would not be adequately met?

(b) What, if any, out-of-school needs would not be adequately met?

3. What is the value of rationalizing processes? *e. g.*, How valuable is it to get pupils to understand multiplying by a fraction or inverting the terms of the divisor in dividing by a fraction?

4. As a means of temporary help, does it pay to rewrite numbers in subtracting fractions?

In Denominate Numbers.

1. How much first-hand experience in using the units of measurement is essential?

2. Which is better, to teach square measure by *developing* concepts of the various units,—square inch, square foot,

[14]In this, as in all questions that have a formal alternative, the final conclusions as to value must take account of the full effect of the more formal procedure. In the final answer to this question it may very well be found that even though the division *per se* were done as well or better by the more formal method, the more rational method would still be of greater value, because of the injurious effects caused by the more dictatorial, *instilling* method of presentation. As is evident, such questions may become problems of the psychology of habituation and memorizing before they are finally answered. This is a very difficult field of experimentation, but of great importance. At present we have only conjectures as guides. We need conclusions based on scientific studies.

5. In division of decimals, is it better to make the division integral by removing the decimal point equally in divisor and dividend or to locate the decimal point in the quotient by rule? square yard, etc.,—or to proceed immediately to the formula, *the number of units in the length multiplied by the number of units in the breadth gives the area?*

3. The same information is needed regarding the teaching of cubic measure.

In Percentage.

1. What is the best approach to percentage, through common or through decimal fractions, or through both?

2. What is the place of formulae? Should they be introduced at once or as soon as enough analysis work has been done to enable the majority of pupils to see the reasonableness and the more capable ones to grasp the significance of the procedure, or not at all?[15]

3. Is the use of x and the *algebraic* method best?

4. What is the value of working by the so-called *cases* of percentage?

In Interest.

1. Which of the various methods of reckoning interest is best, the so-called common method, the 6 per cent. method, the 12 per cent. method, the method by aliquot parts or the cancellation method?

2. To what extent should more than one method be taught in the elementary school?

3. What is the place of interest tables in teaching the subject?

In Reasoning.

1. How many of the various types of reasoning must be specifically taught in order to insure capability in handling all types?[16]

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[15]It is evident that the answer to this question, in common with many others, must include both a psychological and a sociological consideration. For if the mental effect of a given procedure is not objectionable, the social need may rightly decide the question of its being chosen. Compare questions 1 and 3 under *The Practical or Sociological Phase* of the first question above.

[16]See Suzzallo, *Reasoning in Primary Arithmetic.* California Education, June, 1906. Here Professor Suzzallo suggests the following order for the 20 types: 1 (+), 2 (−), 3 (+ +), 4 (− −), 5 (+ −), 6 (− +), 7 (×), 8 (÷), 9 (× ×), 10 (÷ ÷), 11 (× ÷), 12 (÷ ×), 13 (+ ×), 14 (× +), 15 (− ×), 16 (× −), 17 (+ ÷), 18 (÷ +), 19 (− ÷), 20 (÷ −).

2. How potent is the language difficulty in the reasoning work of arithmetic?[17]

3. In the light of the language difficulty, what ages are best for teaching the various types of reasoning?

4. What is the effect on reasoning ability of omitting all systematic arithmetic work from the first one or two grades?

5. What is the effect on reasoning ability of teaching the formal operations to the exclusion of reasoning work? *i. e.,* Is the work in the so-called fundamental operations really fundamental to reasoning or must the operation be taught in situations demanding the respective operation in order to insure ability in knowing *when* as well as *how* to perform a given operation?[18]

6. What is the effect of using the so-called *real* or vital problems as opposed to 'bookish' ones?

7. How full should analysis be?

8. How much labeling should be required?

(a) At what stages in learning is it essential?

(b) When and to what extent should it be abandoned?

9. How important are so-called accuracies of statement? *e. g.,* in stating the process of determining the cost of 15 pencils at 5 cents each, how essential is it that the child state his operation 15 times 5 cents rather than 5 times 15?

10. How large a portion of arithmetic time ought to be devoted to the reasoning part of arithmetic? *i. e.,* What is the right apportionment of time between concrete and abstract problems?

11. How far ought combinations, tables, rules, etc., to be rationalized?

Vacation Losses.

1. What is the effect of vacation on respective abilities in arithmetic?

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[17]Suzzallo, Opposite citation.

[18]It is evident that even if the direct help, to reasoning, of previous isolated teaching of the operations is practically *nil*, there is still the question whether it is not economical to have already acquired ability in the formal work when reasoning is demanded by concrete situations. Even if it be shown that reasoning can be more economically taught after formal ablity has already been acquired, it is still a question whether learning the mechanical operation without the motive of a felt need is desirable for the pupil.

2. How can vacation losses best be counteracted?

3. What is the relation of large amounts of drill to vacation losses? *e. g.*, of extended reviews and drills for final examinations?

4. What is the value of vital problems as a means of counteracting vacation losses? *i. e.*, if arithmetic is so taught that it stands for the quantitative aspects of the pupil's interests, does the pupil's unconscious and conscious use of the subject through vacation appreciably help in counteracting vacation losses?

Utilizing the Play Tendency.

This topic has been previously considered in this article from the standpoint of the practical values of the subject—question three; and from the standpoint of the 'Cultural' values of the subject—question four. The following questions are stated from the standpoint of the teaching of arithmetic *per se*. The large question here is *How much better, if any, do children learn arithmetic when their play tendencies are utilized?* Some of the specific problems are:

1. How much of arithmetic can be taught incidentally and informally by a wise provision of well-selected games for home and school recreations?[19]

2. What is the effect of adapting such games as dominoes to class use as a means of teaching the recognition of number symbols? In dominoes, for example, the dots are placed on large cards, and after the game is learned it is so conducted as to appeal to friendly rivalry and emulation as well as to the primal instincts of physical and mental activity.

3. What effect does the utilization of counting involved in selecting the number of pupils needed in such play games as *Soldier Boys* have on teaching to count by *ones, twos* and *threes?*[20]

4. What are the effects of utilizing the motive of score-

[19]This question is particularly applicable to the arithmetic work of the lower grades. Much apparently good work is being done in several schools and in a few recent textbooks. But no scientific study of its values has been made.

[20]In such situations as this, the arithmetic used is not germane to play itself, but comes in rather as a means of furthering preparations for play. It may be termed a by-product. Many teachers are utilizing it to apparent advantage. Its exact value ought to be known.

keeping and score-computing in teaching addition, multiplication, etc.?

5. Under what stimulus do children learn to subtract the more readily and effectively, that of making change for the purpose of purchasing articles in a play store or that of following the directions of the teacher for the purpose of taking away a given number from another given number?

6. What effect do organizing and conducting a play bank have on the teaching of the use of pass books, deposit slips, checks, bank discount, stocks, etc.?

Such 'dramatizations' of life situations are common in the more progressive schools. Their value ought to be more definitely known.

The Distribution of Arithmetic Among the Grades.

1. Are pupils more efficient at the end of the elementary school course if they begin arithmetic in the first school year than if they begin it later? What are the effects of omitting the subject from the first grade? From the first and second grades?

2. What is the effect of omitting arithmetic for a term or a year from one or more of the intermediate or grammar grades?

3. To what extent is a spiral treatment of the topics of arithmetic desirable?

Among the questions not covered by this article is *the importance of the effect of work on arithmetical abilities.* It is commonly believed that engaging in certain kinds of work promote these abilities in a marked degree. This belief should be tested. Other topics that have been partially covered, but which merit definite treatment, are: *The time cost of arithmetic, motivation vs. drill, textbook vs. community problems and the efficacy of supervision of the teaching of arithmetic.*

MENTAL ADAPTATION DURING THE SCHOOL DAY AS MEASURED BY ARITHMETICAL REASONING.—PART I.

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GENERAL SUMMARY.

In the best current pedagogy considerable attention has been given to the results of pedagogical investigations on mental fatigue in school children, but little attention has been given to the cognate phenomena of mental adaptation. The belief is current that the earliest hours of the school day are the most suitable for severe mental work of a rational kind. An attempt is made to show whether this belief is well grounded or not. Whole classes, working always under one teacher, have been divided each into two equal groups on the basis of several tests in problematic arithmetic. Then, subsequently, one of the two equal groups has continued to work similar tests early in the morning session, and the other has worked the same tests later in the morning session. The work has been done with children of various social classes, of various ages and of various grades of mental ability as measured by school standards. In all cases, except one, the group of children who work later have done better work than those who work earlier. The difference in improvement appears to be about 5 or 6 per cent. In one case, that of a school in a very poor neighborhood, the earlier working group improves more rapidly than the one working later. About half the boys in this class "go to work" very early in the morning before commencing school, and nearly all of them do some work before school begins. It is suggested that their general mental adaptation is at its height earlier in the morning than that of children in other schools. The conclusions generally are in direct contradiction to current pedagogical practice in England. If well grounded, a considerable change in

school time-tables seems desirable. Severe mental work of a rational kind, except in the very poor schools where the boys rise early and "go to work" before school, should be placed later in the school session than it is at present.

I. The Problem Stated.

The experiments about to be described were undertaken as a companion piece of work to that on "Mental Fatigue During the School Day," published in the *British Journal of Psychology* for December, 1911. Educationists, when considering pedagogical practices, have shown themselves not unwilling to take into consideration the results of experimental work on mental fatigue, but it can scarcely be said that much attention has been paid to the cognate phenomena of mental adaptation.

Yet it is obvious, on a moment's consideration, that the one is as important as the other. For if a knowledge of the conditions of mental fatigue enlightens the educationist as to the "worst times" for certain functions, so a knowledge of the conditions of mental adaptation enlightens him as to the "best times."

It is generally accepted in elementary schools throughout the civilized world that the rational parts of problematic arithmetic present more difficulty to children than any other subject taught in these schools. In England, therefore, educationists have argued that we must teach this subject as early in the morning sessions as we can. For historical reasons, "Scripture" (almost invariably) occupies the first school period, namely, from about 9 to 9.40 A. M., a few minutes after 9 being allowed for registration. In a report on the *Teaching of Mathematics in Elementary Schools,* recently published by the English Board of Education, Mr. P. Ballard points out that it is the almost invariable practice to take the arithmetic lesson in the school period which commences about 9.40 A. M., immediately following Scripture lessons.

Having regard to the nature of general mental adaptation, it seemed to me that the English practice might be based upon a misconception as to the best time in the morning for arithmetical reasoning. The following investigation was undertaken to supply some evidence bearing on the question.

II. First Series of Experiments.

1. *General Plan.*

A first series of experiments was carried out in a London municipal boys' school situated in a very good suburban neighborhood. The boys averaged 9 years 2 months in age and were graded as Standard III. The whole class, about 40 in number, was divided into two equal groups on the results of a number of tests in problematic arithmetic. Then, subsequently, one of the groups continued the work *early* in the morning sessions, and the other group *late* in the morning sessions of the same day. Comparisons are instituted to show which time appears the more favorable to work of this kind. All the tests were administered by the teacher of the class—an able man with some experience of research work in biology, but somewhat new to psychological investigation.

2. *The Tests and the Method of Marking.*

The sets of tests used were all constructed on the same plan. The questions were cyclostyled, and each boy on each occasion was provided with a separate question paper. One such set follows:

1. One pole is 35 feet long and another is 17 feet long. How long would they reach if put end to end? (One step.)
2. Mary has 3s. 4d. and Alice has 2s. 7d. more than Mary. How much have they together? (Two steps.)
3. Jack has 46 marbles and Tom has 38 marbles. How many must Jack give Tom so that they have equal shares? (Two steps.)
4. One boy earns 1s. 6½d. a week and another earns twice as much. What do they earn together in a week? (Two steps.)
5. Mother shared some nuts equally among five children. Each child got 36 and there were seven left over. How many nuts did mother have at first? (Two steps.)
6. A man bought a motor car for £200. He kept it for four weeks and it cost him £3 a week for a man to look after it. He sold it afterwards for £220. How much did he gain? (Three steps.)

All the other sets of tests were like the above, except that the subject-matter of the problems and the figures were changed. But in this school the *order* of the problems, set by set, was *not* changed; that is, problem 1 in the first set retained its place as problem 1 in the second set, and so on. The children were asked to solve the problems numerically. This

process was, of course, a regular school exercise, and it was not necessary, as it often is in the case of new exercises, to give a number of preparatory tests before the children begin to settle down into their proper places. But even in this case the results of the *first* test were discarded. In marking the work no attention was paid to the correctness or incorrectness of the numerical solution, but the sums were looked through to see how they had been worked from a problematic standpoint. As teachers would say, "Was the problem done the right way?" We marked to answer that question, allowing one mark for every rational "step" which was on the way to a correct solution, even though no solution was actually arrived at. It will be seen that the figures were so chosen that mechanical difficulties of computation were avoided. The maximum mark obtainable for each set of problems was 12.

3. *Chronology of the Experiment.*

The first test took place on Friday, July 23, 1911, at 10.15 to 10.40 A. M., a few days before the summer vacation. Neither the teacher of the class, the head master of the school, who was relatively new, nor myself were quite sure that the tests were of the right pitch of difficulty; so this preparatory test served a double purpose: it enabled the boys to get practice in working the tests precisely in the form required, and gave us an opportunity of analyzing the results to see how far the tests were suitable.

Forty boys did this preparatory test, and we found that

2	boys	obtained	12	marks.
4	"	"	11	"
3	"	"	10	"
5	"	"	9	"
2	"	"	8	"
9	"	"	7	"
5	"	"	6	"
5	"	"	5	"
3	"	"	4	"
2	"	"	1	"

Every boy was able to do something; two received full marks, and the bulk of the class received from 5 to 9 marks. The marks actually obtained amounted to 60.6 per cent. of the possible marks. It would interest teachers to know that the

40 boys scored 34 marks for the first problem, 58 for the second, 43 for the third, 48 for the fourth, 65 for the fifth, and 43 for the sixth. It is, perhaps, important to note that in this experiment exactly 25 minutes were allowed for working the problems, and it was intended to retain a rigid time limit throughout.

After the summer holidays were over, and the children had had a couple of weeks in school to become generally adapted to mental work, the preliminary tests were begun. They were given on Monday, Tuesday, Wednesday, Thursday and Friday of the week ending Saturday, September 9, from 10.15 to 10.40 A. M. The lessons preceding were Scripture every day from 9.10 to 9.40; then from 9.40 to 10.15 on Monday, Wednesday and Friday the lesson was Word-building; on Tuesday it was Reading, and on Thursday the Repetition of Poetry already partially known. It will be seen that there was nothing in these lessons likely to affect prejudicially the results in arithmetical reasoning. No arithmetical lessons of any kind other than the tests were given during the week. The children were not told day by day what marks they had obtained, but at the end of the week, which they had been told to await, they *were* informed, though, of course, no errors were pointed out, nor did they know their marks for particular problems.

The next week's lessons, arithmetical and other, proceeded just as usual, and a division of the class into two equal groups was made on the results of the five preliminary tests which had been done the week before.

The week after, the final tests began. They were given on Monday, Tuesday, Wednesday, Thursday and Friday of the week ending Saturday, September 23. One of the two equal groups—Group A—worked their problems from 9.40 to 10.5 A. M., whilst the other group—Group B—wrote an English composition exercise. They were required to construct a story containing certain words, or to write an imaginary account of how a situation, indicated in a picture given to them, arose. Both groups worked all the time in the same room under the same teacher. Then from 10.5 to 10.35 both groups had the same lessons, which differed on the different days of

the week, but were in all cases oral lessons. At 10.35 the boys went into the playground, returning at 10.50. There were then two short lessons from 10.50 to 11.10 and from 11.10 to 11.25; they comprised Physical Exercises, Dictation, Object Lessons, Spelling and Penmanship. It is better for experimental purposes to have the same lessons day by day, but it is also good at times, for practical purposes, to take the school time-table exactly as one finds it. At 11.25 the boys in Group B worked the same test problems previously worked earlier in the morning by Group A, whilst Group A worked the corresponding exercises in English Composition. At 11.50 all work was stopped. The results of their work on the test problems and the composition exercises were made known to the boys at the end of each week, but not before. We now had the results of five preliminary tests given to the whole class at 10.15 A. M., and those of five final tests given to one group at 9.40 A. M., and to the other group at 11.25 A. M. If the daily habituation, produced by working a particular kind of exercise at a particular time, is a factor in the result, and I should hesitate to deny it, it would operate on the whole in favor of the group working at 9.40, for the five lessons in arithmetic given to the class weekly are taken at 9.40 A. M. on Mondays, Wednesdays and Fridays; at 11.15 A. M. on Tuesdays, and at 2 P. M. on Thursdays. This is an unusually irregular placing of arithmetical lessons for Standard III, but still the balance of habituation is, as usual, in favor of the school period commencing about 9.40 A. M.

4. *Results.*

The preparatory test given before the summer holidays was worked by 40 boys. A few additional boys were placed in the class after the vacation, so that 44 boys were available for division into two equal groups. One boy, H. B., in Group B, was away during the week of the final tests; the corresponding boy, A. W., in Group A, was, therefore, omitted. The correlation coefficients between the successive tests in the preliminary tests were, between 1 and 2, + .69; between 2 and 3, + .77; between 3 and 4, + .94, and between 4 and 5, + .87. In the final tests the correlation coefficients were, between 1 and

2, + .90; between 2 and 3, + .83; between 3 and 4, + .87, and between 4 and 5, + .90. The correlation between the totals of the Group A series and the totals of the Group B series were in the preliminary test + .99, and in the final tests + .89.

I will give first the comparative results in gross. Group A averaged 9 years 2 months in age, whilst Group B averaged 9 years 1½ months. Group A scored an average mark per boy per test of 7.9 (mean variation 1.7) in the preliminary tests and 8.4 (mean variation 1.9) in the final tests. The corresponding marks for Group B—the group which worked the final tests later in the school session—were 7.9 (mean variation 1.7) in the preliminary tests and 8.8 (mean variation 1.8) in the final tests. Group A improved 6.3 per cent. on its preliminary record; Group B improved 11.4 per cent. There is, therefore, a balance in favor of the later working group of about 5 per cent.

I will next show the comparative results, test by test:

Table I, showing the results of Group A and Group B compared, test by test, in the preliminary and final tests.

		Preliminary Tests.					Final Tests.				
		1st.	2d.	3d.	4th.	5th.	1st.	2d.	3d.	4th.	5th.
Group A.	Av. mk.....	6.6	7.9	8.1	8.3	8.5	8.5	8.4	8.1	8.5	8.6
	M. V.....	1.8	1.8	1.8	1.8	2.0	1.8	1.9	2.1	2.3	1.7
Group B.	Av. mk.....	6.6	7.6	8.2	8.6	8.4	8.2	8.2	9.1	9.1	9.2
	M. V.....	1.6	2.0	2.1	2.0	2.3	1.7	1.8	1.9	2.0	2.2

It will be noticed that Group B does not start off so well as Group A in the final tests, though before the week is out it has forged well ahead. The sudden leap of Group B from an average of 8.2 on Tuesday to 9.1 on Wednesday is very unusual for boys at this stage of practice, and makes one suspect some extraneous factor, but diligent investigation failed to show any, for we had decided, in arranging this experiment, to risk the possibility that some members of the earlier working group might communicate with some members of the later working group during the recreation interval and tell them what problems they had worked and how to solve them. The alternatives were (1) to retain one of the groups in the schoolroom during the play interval; (2) to keep the two groups separate in the playground whilst play was going on. Neither of these courses was adopted, for they would both of them

have vitiated the result. We wished to know what would happen *under the usual conditions of school life* both as to work and play; moreover, to take obvious steps to prevent boys from communicating is to make them suspect at once that there is something special going on, and that is precisely what we endeavored to avoid. To treat the whole thing as part of the usual school routine—to display no special interest or anxiety about it—was the best way to avoid an unintelligent co-operation on the part of pupils to produce unusual results—a co-operation which might have been useful pedagogically, but would have been misleading psychologically.

Moreover, communication from boys of Group A to boys of Group B certainly did not occur in any general way. The boys were unostentatiously watched, and were at play in playtime, as boys usually are; they were not seen standing in corners, anxiously listening to arithmetical "tips" from one another. And, further, if boys received "tips," and profited by them, they would "jump up" above boys who, previously higher in the lists, had remained "tipless." But if the boys had changed places much from exercise to exercise, the coefficients of correlation between the successive exercises of the final tests would not have been .9, .8, .9, .9.

Finally, I will give the comparative results of the two groups, section by section, so as to indicate how far the superiority of Group B over Group A is common to the more as well as to the less proficient pupils:

Table II, showing the work of Group A and Group B compared, section by section, in the preliminary and final tests.

	Group A.			Group B.		
Marks for 5 preliminary tests. Max. 60.	No. of boys.	Av. mk. per child per test in 5 prel'y tests.	Av. mk. per child per test in 5 final tests.	No. of boys.	Av. mk. per child per test in 5 prel'y tests.	Av. mk. per child per test in 5 final tests.
Over 50.....	3	11.3	11.7	3	11.3	11.5
40 to 50.....	7	8.9	9.7	7	8.9	10.2
30 to 40.....	8	7.1	7.6	8	7.0	7.7
Under 30.....	3	4.1	4.3	3	4.3	5.5

It will be seen that in the case of the very proficient boys at the top of each group the early morning workers do better than those who work later in the morning, but in all other

cases the advantage is with the sections working later. The weakest section in Group B shows a greater superiority over the corresponding section of Group A than might reasonably be expected. It contains W. G., the bottom boy in Group B, who improves from an average of 1.4 in the preliminary tests to 4.0 in the final tests, whilst H. W., the corresponding boy at the bottom of Group A, improves from 1.4 to 1.6 only. W. G.'s improvement must certainly be looked upon with suspicion at this stage of practice; it is probably not due to practice alone.

III. Second Series of Experiments.

1. *General Plan.*

A second series of experiments was carried out in a girls' school situated in a fairly good neighborhood in the southwest of London. As before, a whole class was divided into two equal groups on the results of a number of preliminary tests in problematic arithmetic. Then, subsequently, one of the groups continued the work early in the morning sessions and the other group late in the morning sessions of the same days. A comparison between the work of the two groups is instituted to indicate which time is the more favorable for work of this kind. The children were of an average age of 12 years 11 months, and were graded in Standards VI and VII. All the tests were administered by the head mistress, who had had much experience of experimental work with children.

2. *The Tests and the Method of Marking.*

The sets of tests used were all constructed on the same plan. One such set follows:

1. Three men earn 27 shillings a day. If 7 men earn as much as 10 women, how much would 23 women earn in a day? (Four steps.)
2. On market day a farmer's wife sold 36 pairs of chickens at 4s. 3d. a pair. To how much did her sales amount? (One step.)
3. A large box took 5 feet 7 inches of wood to make; a small box took 3 feet 9 inches of wood. Out of a number of planks a man could make 100 large boxes. About how many small boxes could he have made? (Three steps.)
4. A man divided 840 acres into three portions. The first was four times as large as the second and the second was four times as large as the third. How many acres were there in the third portion? (Four steps.)
5. Two cyclists set out to ride 70 miles. The first rode at the rate of 9 miles an hour and the second rode at the rate of 11 miles an hour. How long a time did one man arrive before the other? (Three steps.)

6. A girl had 9 sums to do every day for 19 days. She only did 114 sums altogether. If she left out the same number of sums each day, how many did she leave out each time? (Two steps.)

7. A shopman had 93 pounds of bacon to sell. The bacon had cost him £4 12s. 6d. If he sold it for £5 0s. 3d., what profit did he make on each pound? (Two steps.)

8. A man mixed 7 pounds of coffee at 1s. 10d. a pound with 3 pounds of chickory at 10d. a pound. At what price did he sell the mixture per pound if he neither gained nor lost money on the sale? (Four steps.)

The numbers used and the wording of the problems varied from set to set, but the principle of each problem remained the same. The *order* of the problems was also varied from set to set. The maximum mark for the rational steps in the solution of each set of problems was 23. The children were not required to solve the problems numerically, but to state in writing exactly how they would do so. One mark was allowed for every rational step correctly indicated.

3. *Chronology of the Experiment.*

The great difficulty in all experiments of this kind is to secure steadiness in the results. Especially is this difficulty experienced in the case of new exercises. Though these children had, of course, often solved arithmetical problems, they had not been accustomed simply to write down *how they would solve them.* So, after a lesson had been given to indicate exactly what they were to do, three sets of problems of the kind given above were administered under test conditions at 10.45 A. M. on Friday, September 1; Wednesday, September 6, and Thursday, September 7. The papers were examined carefully, and it was found that "steadiness" had hardly yet been satisfactorily achieved. So at 10.45 A. M. on Friday, September 8; Tuesday, September 12, and Wednesday, September 13, three further sets of tests were given, which will be subsequently referred to as the preliminary tests. The lessons preceding the tests were Scripture, and an oral lesson in English Composition, History or Geography. Then also preceding the tests, from 10.30 to 10.45, came the morning interval for recreation.

On the results of the three preliminary tests the class was divided into two equal groups. Then about a week later the final tests were given. Group A worked them at 9.40, imme-

diately after a Scripture lesson, whilst Group B, in another room, studied some English History during a part of the lesson, and then answered questions on paper on what they had been studying. After the recreation interval a lesson in English, which included paraphrasing and the construction of sentences containing certain selected words, was given to both groups. At 11.15 A. M. the class was again divided. Group B worked the problems previously worked by Group A, whilst Group A studied and answered the questions in history previously done by Group B. The final tests took place on Friday, September 22; Tuesday, September 26, and Wednesday, September 27. Before each test, both in arithmetic and history, the girls were told what marks they had gained in the last exercise, but no reference was made in either case to general or individual errors.

4. *Results.*

First, it is important to notice the degree of regularity in the work of the children as shown from test to test. Jumpy results in the preliminary tests imply that a division into "equal groups" will be very difficult to effect, and, indeed, may scarcely be reliable even when it is effected. The coefficient of correlation between the results of the first and second preliminary tests, where "r," the coefficient of correlation, $= \frac{\Sigma xy}{n\sigma_1\sigma_2}$, amounted to + .752, and between the second and third preliminary tests amounted to + .852. With 44 cases and coefficients of this size, the probable errors are very small. The coefficient of correlation between the results of the first and second of the final tests was + .856, and between the second and third + .872.

The total marks of the A series correlated with the total marks of the B series to the extent of + .99 in the preliminary tests and to the extent of + .78 in the final tests, with coefficients calculated in both cases on the moment-product method from the individual results.

I will next give the comparative results in gross. Group A obtained in the preliminary tests an average mark of 15.6 (mean variation 2.7), whilst Group B also obtained an average

of 15.6 (mean variation 2.7). In the final tests Group A obtained 15.9 (mean variation 3.0) and Group B 16.8 (mean variation 3.3). Group A improved on its preliminary record to the extent of 2 per cent., whilst Group B improved on its preliminary record to the extent of 7.7 per cent., which gives about 5 or 6 per cent. as an increase which may be due to mental adaptation.

I will next show the comparative results, test by test:

Table III, showing the results of Group A and Group B compared, test by test, in the preliminary and final tests.

		Preliminary Tests.			Final Tests.		
		1st.	2d.	3d.	1st.	2d.	3d.
Group A.	Av.....	14.8	16.0	16.0	15.0	16.0	16.7
	M. V.....	3.1	3.0	2.8	3.5	2.8	3.5
Group B.	Av.....	14.9	15.8	16.0	16.0	17.0	17.4
	M. V.....	2.8	3.2	2.8	3.7	3.2	3.6

Finally, I will show the comparative results of the two groups in such a way as to indicate how far the superiority of Group B over Group A is common to the weaker as well as to the abler pupils:

Table IV, showing the work of Group A and Group B compared, section by section, in the preliminary and final tests.

	Group A.			Group B.		
Marks for 3 preliminary tests. Max. 69.	No. of girls.	Av. mk. per child per test in 3 prel'y tests.	Av. mk. per child per test in 3 final tests.	No. of girls.	Av. mk. per child per test in 3 prel'y tests.	Av. mk. per child per test in 3 final tests.
Over 55.....	5	20.5	20.3	5	20.3	22.2
45 to 55.....	7	16.2	16.6	7	16.3	17.3
35 to 45.....	7	13.9	14.3	7	13.9	14.8
25 to 35.....	3	9.9	10.6	3	10.1	11.1

Rather unexpectedly, the highest section of Group A shows a slight loss from the preliminary to the final tests, whilst the corresponding section of Group B shows, unexpectedly, a large increase. I do not regard the whole of the difference between the work of these two sections in the final tests as being due to the difference in the time at which they were worked, though some of it is doubtless due to that factor. The differences between the other corresponding sections of the two groups are such as one would expect to find if a small but steadily acting cause were influencing the results in the same direction.

(*Concluded in the February number.*)

THE CHILD'S SPEECH.

IV. Word and Meaning.

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1. The beginning of speech is the most momentous event in the history of the child. Its understanding is a key to the whole storehouse of knowledge, and upon its use all human fellowship depends. As the means of social intercourse, the repository of learning and the general instrument of intelligence, the invention of language constitutes the greatest single achievement of human evolution.

In individual development the significance of this invention is concentrated manyfold. What the slow course of human progress accomplished for the race in long ages is achieved for the child in a few short years by the possession of speech and writing. Through the former he becomes articulate and rational, through the latter informed and cultured. On the shoulders of his race the child is thus lifted to the apex of humanity, with a penetrating intellectual vision and a universal standpoint. In its objective aspect the level from which he was lifted is immeasurably lower than that of the primitive savage. The child at birth is dumb and irrational; his spirit lies dispersed among unco-ordinated impulses and stimuli; self and world are equally chaotic. Yet even in the confusion of this primitive status the two conditions of the child's ultimate development are discernible—his own organizing spirit which at the very dawn of life is struggling to its feet and the world of organized culture which awaits its grasp.

To this active synthesis every element of experience is vital; the impression is fixed through its associations, the reaction made significant by its consequences. But intuitive experience is hampered by its own unanalysed richness. Both the materials to be drawn upon and the ideal system to be con-

structed from them meet early limitation. A more adequate instrument of reflection is needed than dumb intelligence provides, and the substitution of a permanent record for the dissolving features of individual experience must take place if the human mind is to attack its problems successfully. Language supplies both these deficiencies. It is not only the medium of communication, but also an indispensable instrument of the mind in its intellectual procedure; the sword of Siegfried, by which all obstacles are hewn asunder and a path cleared to the goal of knowledge.

2. The function of language in individual reflection is revealed by any study of the service which names perform. In the first place, the name is both a means of fixing the attention of the child upon an object and arouses traces of previous perceptions, thereby prompting apperception; in the second, it is a means by which the child subsequently renews his own attention, and thus becomes an instrument for clarifying and directing his thought; and, lastly, it is a means by which the attention of others may be called to an object and a specific apperceptive disposition aroused. It thus becomes an instrument both for the formulation of his own meaning and for the guidance of another's thought.

3. Language has a formal and a material basis. Its formal condition is the existence of a content of meaning and intelligence to understand and use signs. Language is the employment of symbols to express thought. Its material basis is the existence of verbal signs which have been invented as names of objects. A language is the system of such symbols used in common by a people to express their thought. The possession of a system of common signs implies a communal life on the part of those sharing it, for to have the same sign and to use it for identical purposes necessitates a common history and process of acquisition.

It is the lack of this community of experience which makes the mastery of a new tongue difficult. The meaning of the symbols of speech is never originally given through definition, but through their significant association with the experiences of life. One need not define the words of his mother tongue; such a procedure is both superfluous and inadequate. It is

superfluous because the meaning must be known before it can be defined, and it is inadequate because the complete content can never be translated into words. Since the foreigner must thus depend upon definition in terms of his own tongue, he fails to enter completely into the genius of a new language.

Between the acquisition of language by the race and its development in the individual there is, of course, the fundamental difference that in the race it meant the invention and development of the system of signs itself, while for the individual it is only the understanding and acceptance of a body of symbols already formulated and in common use by his fellows. He is not free to choose his own signs; at the same time he is not called upon to invent them. He must set himself to learn a great and complex system of symbols; nevertheless his task is largely simplified by the fact that everyone about him uses the same name for a given thing, which secures the incessant recurrence of the symbol in association with its object. The specific problem in the acquisition of speech is to establish this precise association between each word and its meaning or intellectual object. In learning the mother tongue it is to do this in the absence of all verbal means of indicating the object or explaining its nature.

4. The earliest connection between word and thing is not that of a name with the object it denominates. It involves simply the association of the two contents of experience with one another. When the object has been seen or handled—in the wider sense when the situation has been presented—the name has been heard. The recurrence of these two facts in a concrete complex is the basis of their association in thought. The repetition of this experience links the two elements—name and thing—in such a way that when the name is heard the child tends to look for the object or to represent it in mind. The word is not yet a name. At some stage in the process the word becomes a means of indicating the object (a demonstrative term) and of representing it (a connotative term); when the thing is seen or imagined the child now tends to speak its name or to raise it in mind. Earlier in the process of development, however, the word only causes the child to look for the object or raises the idea of it in his mind, as the

sight of one of two familiarly associated things will carry the mind on to the thought of the second without in any way becoming a name for the latter.

5. In many ways the association of a name with the object is found useful, for the sensible world is not broken up into separate objects in such a way that the ready-made individual isolates and rivets the attention of the child; on the contrary, he must resolve the perceptual field, as it is presented at any moment, into its constituents by a process which is slow and difficult. In its course the child is ready to grasp at anything which will help in fixing his wavering attention and in marking out the particular thing from the continuum of perception in which it appears. Among such means the word or name is chief. To utter the name helps to recover the results of former syntheses of perception and affords a basis for a more definite and stable apprehension of the object then presented. Naming, in thus fixing attention, helps to clarify the object of perception.

The name serves also to fix attention upon things which are absent. Its association with the object becomes more significant than any particular quality or function of it in proportion as the synthetic apprehension of the object increases in richness. The word does not carry the mind to any individual and limited aspect of the thing, but to that common reality with which all such special qualities and functions are connected or in which they inhere. It comes, in other words, to be a name for the thing. Thus representing the object as a whole, the name becomes its most general and revivable associate. To recall its name is now the most ready mode of reviving the memory of the thing for which it stands. Names thus become the chief means by which we represent things and think about them.

Speech is mastered when this association between words and ideas has been thoroughly established in the individual mind. It is understood when the succession of words one hears arouses in an unhesitating and effortless way the system of ideas which they are designed to express. The use of speech has been mastered when the rise of any system of ideas in the mind is capable of originating in the same direct and secure

way an appropriate series of representative words. The child early attains this status. By the close of the third year he is both intelligent and voluble. The body of homely speech is familiar to him, and he is fluent in its use.

6. Though the development of speech goes on rapidly, the process of acquisition is inwardly complex and subject to many disturbances. At the beginning is given only the utterance of a sound as the accompaniment of a concrete situation. This situation is indefinitely complicated and the sound is, *a priori,* associable with any part or aspect of it. All specific connections have to be established by actual trial and error. The earliest word must therefore be thought of in its temporal relations only; it is connected with experience at a particular moment in its course, but is connected with the content of that moment in its entirety.

As a matter of fact the situation carries more or less definite indications of the association group into which the word is to enter. Within the total field which is presented to consciousness at any moment the child's attention is at work, selecting and emphasizing, so that the word which in general can only be said to accompany that moment of experience as a whole is actually associated with the particular aspect or portion of the field upon which consciousness is focussed. Moreover, the word is commonly accompanied by an act whose meaning is already, in general terms, understood—smiling, frowning, pointing, holding, using, etc. It is the presence of such acts which chiefly directs attention to a particular part of the field and provides a starting point for the development of that content of meaning which the sound is thereafter to receive. But the existence of this enlightening system of looks, gestures and acts depends, of course, upon a similar association process previously established in the child's mind in just such a way as these subsequent and more definite conceptions arise. The look and gesture have meaning only in virtue of a specific situation with which they have been typically associated in the child's experience. It is therefore ultimately only a question of the uniformity of association between the word or other expressive reaction and a concrete situation, which

at the outset must be conceived simply as the total set of circumstances presented at the moment.

The establishment of the word's proper association now depends upon securing its utterance in conjunction with the rise of attention to that particular aspect of the concrete situation which it is designed to connote. Consciousness is, of course, primitively indifferent in this regard. Mark Twain humorously recalls this fact to our minds in Eve's reply when Adam inquired why she called a certain beast an elephant: "Because it looked like an elephant!" Any name may go with any object; there is no natural adaptation between the two. Each specific connection must be experimentally determined.

7. It is evident that in this process both the content associated with the word may be unduly extended or restricted, and its specific character and relations distorted in innumerable ways, as when Taine's child applied the term *bébé* (first learned in connection with the Christ child) to all pictures instead of to all children. The child's mind wanders at first in a fluid medium of relations which is potentially indefinite. It cannot receive, along with the presentation of the word, a formal definition of its content in terms already known. Its concepts must be defined through a process of simple and direct experimentation with the terms of speech. The misuse of words commonly entails specific, practical penalties, which spur the child on to renewed attempts at expression in modified forms. Through a series of such corrections the limitations and essential content of a term come into view, and the child is then said to have mastered its meaning.

The adult is prone to lose sight of the complexity of the problem by which the child is faced in learning speech. His world is already so full of meaning, so widely systematized, that each new element is illuminated by the defining and directive forces which he brings to bear in its interpretation. Though every sentence he hears is a novel combination of elements, it may thus be rendered entirely intelligible. In the case of the young child all this synthesizing is yet to take place, and the whole system of correspondences must be established point by point in a world which at the outset is a practical and intellectual chaos.

Such a process is subject to many errors of direction. The influence of practical experience is negative. It punishes mistakes, but scarcely indicates their remedy. Progress depends upon the individual's own initiative, and rectification in the use of terms may come very slowly or not at all. Malaprop and Partington are classical literary examples of such arrested development. If terms occur only in one's reflective criticism of life, and not in the practical adjustment of its affairs, such misconceptions may persist into adult life even among the educated. I know one university graduate who used the word "tolerable" as an equivalent of *dreadful,* and another who spoke of an "information of the leg" when he meant an *inflammation.*

8. The child's task in defining and correcting verbal concepts is a laborious one, and in its earlier stages his mind is beclouded by a confusion of fantastic meanings which, with more or less plausibility, he has given to the terms of common speech. This appears most dramatically in his verbal substitutions. *Apostles' creed* appears as "pots of cream;" *palisades* becomes "parlor shades;" the *baccalaureate* is transformed into the "paregoric sermon;" the phrase, "children of *believing* parents" puzzles the child who thinks it restricts baptism to the offspring of the "leading parents."

Resemblance to other words leads to wholesale misconception. "Lava," wrote one child, "is what the barber puts on your face;" "the equator," said another, "is a menagerie lion running around the middle of the earth." Floating verbal associations are seized upon and unreflectingly appropriated. "Water," an English school child wrote, "is composed of two gases, oxygen and cambrigen." "He was making his flag offering before the glass with many flourishes," writes a correspondent; "I pledge agility to my flag and to the republican for which it stands!"

Words may not have any definite content for the child; they may only vaguely stir the mind or provoke a purely emotional reaction. Of a counting-out rhyme which ended:

"One flew east and one flew west;
"One flew over the curlew's nest,"

the writer of a delightful pedagogical essay says: "What flew east and what flew west she never had, I think, the slightest idea. But she felt no need of explicitness. It was enough to see in vision the darting of swift, shadowy wings across a great, beautiful sunset sky."

In his mistakes, as truly as in his orderly progress, the child is using speech to express his meaning in exactly the same way as the adult. Extensions and corrections, change and progress, conform to the same principle in the two cases. All communication must be in terms of the vocabulary possessed. Where few verbal concepts exist in the child's mind their denotation must be extended; where subtler distinctions are to be expressed than are yet embodied in substantives qualifying terms must be introduced; where speech fails him altogether he falls back upon gesture and pantomimic representation. It is through such incessant attempts to mold the plastic materials of speech to his own immediate practical needs that mastery actually comes, and one cannot well imagine its attainment in any other way.

9. Nevertheless, there is need of bringing the child to realize the exact content of the terms he uses by analysis as well as by application. The words themselves must be made objects of study if a fine sense of their values is to be cultivated. For the literary artist this study never ends, but in the common use of speech it scarcely enters except under some occasional stimulus. It is part of the teacher's work to arouse the child's interest in the forms of speech by converting such passing curiosity into an element of systematic method.

He may begin, for example, by calling for a preliminary definition of the word to be studied. This should be given by each member of the class, and should be written down both for the sake of future reference and also to secure an unaffected statement of the meaning which the term possesses for each individual child. These definitions should then be compared together to ascertain their general agreement and adequacy. Such an examination is likely to show that while none is satisfactory, the defects which individually appear are not common to all. Without further criticism of the written defintions than is necessary to show their disagreement, the

application of the term by one member of the class and another should next be called for, and when omissions in its common range of meanings occur, as they usually will, further possible applications should be suggested by the teacher. When a sufficient number of varying instances has thus been got together, set the class to inquire after the common significance which runs through them all. When found, give a name or precise statement to this common property as at least a provisional definition of the term.

With this touchstone in hand suggest plausible but not correct applications of the term and set the children to detect the error, calling for an exact explanation of the grounds for rejecting each such misapplication. It is important to bring out the reasons why these extensions are not legitimate, for the child does not understand a word's exact meaning unless he knows what to exclude as well as what to include.

It is often necessary to proceed slowly with this phase of instruction and to return frequently to the definition, for that must first of all be fixed in mind or the result will be merely intellectual confusion. A cloud of vaguely associated meanings will hover in the child's mind, and in its shadow he will grope in vain for any distinct conception to which he can hold fast.

A serviceable definition having been secured, the study of word and meaning may be extended by the description of groups closely related to the class in question, which the pupils are then called upon to name. The specific difference which sets off each such term from the word studied should then be called for, and the place of the latter in a system of related terms thus set forth.

After such exercises as these in the discrimination of meanings and terms the definition should be called for again orally; and as it is formulated from the successive statements which the children contribute, bring the class to see that the definition is but a statement summing up the common factors or essentials to membership in the class. Criticise each defintion as it is offered, pointing out in what way it is defective, and emphasize the need of keeping these successive corrections in mind as the class proceeds in its work of formal definition.

With this worked out, have each member of the class turn to the definition he had originally given, and criticise it with a view to bringing out the specific defect latent in each.

Finally, set the class to explore the ramifications of meanings connected with the term in question, listing accepted variations, discriminating shades of difference, enumerating synonyms, noting analogical transferences of meaning and defining related words in terms of their differences from that studied. Add also what may be useful concerning the history of the word, its root significance and the successive changes of meaning it has undergone, but be careful that these supplementary facts do not becloud the child's grasp of the word's present use, which must always remain the cardinal point for the instructor.

(To be concluded.)

COMMUNICATIONS AND DISCUSSIONS.

THE RELATION OF BREATHING TO ORAL READING.

Some of the recent investigations in reading, such as Dearborn's work in eye movements, have emphasized the physiological side of the subject. The view held by such investigators is that the reading activity is a highly specialized habit, and that any scientific study of the habit requires, first, a careful analysis of the habitual activity into its elements, and second, a very careful study of these elements.

If reading is viewed from this standpoint, one phase of it which stands out prominently is, as stated in the title, the relation between breathing and oral reading. More specifically our problem is concerned with the difficulties which children have in adjusting their breathing to oral reading and the effect of daily practice upon this adjustment. The relation of this problem to the growth and development of the child is also of much importance. The effect of the training given by teachers of music or elocution is also of interest to us.

The apparatus used in the present investigation was a kymograph, which carried the smoked paper on which the record was made, and a simple form of the pneumograph, which was placed upon the upper part of the chest and connected by means of a rubber tube to a Marey tambour, the needle of which traced the record on the smoked paper. A time line was procured by means of a Jacquet chronometer.

Fifty subjects were used in the experiment. These were university men and women, as well as children from the third to seventh grades, inclusive. The work stopped with the third grade on account of the difficulty in getting children of the primary grades to come to the laboratory, since the distance was so great. No records were taken above the seventh grade, because as the schools are organized here the eighth grade is a part of the high school. Further work in the study will take up the high school phase of the subject.

The reading matter was the same for all the men. In this case a page from Bagley's Educative Process was used. The material for the women was a page from a standard magazine, and was the same for all. For the children the material was selected from the Baldwin series of readers. This was different for each grade, but was the same for the boys and girls of a given grade.

In taking the records very few of the men and women knew any-

thing of the experiment except that it was a test in reading. The apparatus was found to be a disturbing element for many of the children, so that it was thought best to make some explanation of it to them. All subjects stood with the back to the apparatus, so that the amount of attention given to it was reduced to a minimum. Caution was given in all cases that the reading should be done in a natural manner.

Some Tentative Conclusions.

There is a decided sex difference. The girls' curves show much more regularity than those of the boys. This is true when each curve is examined by itself or when those for different individuals are compared. The men's curves are much more regular than those of the women. It can be said that the curves for the men and girls are much alike in their regularity, and that the curves for the boys and women are much alike in their irregularity.

There is a decided improvement for the boys from the third to the seventh grade, although the improvement is more noticeable from the third to the fifth than from the fifth to the seventh. The height of the curves increases gradually.

The curves for the girls are decidedly regular until the seventh grade, when there is a break which evidently foretells the great irregularities found in the curves of the women. The height of these curves increases very much at the fifth grade.

The length of the reading period (time between breaths) is not usually more than four or five seconds, and in many cases it is less. This time can be increased to nine or ten seconds, as is shown by the curves of those who have had considerable training in public speaking.

Some curves show that the subjects are abdominal breathers. This is the type of breathing insisted upon by teachers of elocution and vocal music, and children who have this co-ordination already established have thus a distinct advantage over those who have not.

Some Tentative Suggestions for the Teaching of Reading.

This work indicates a kind of co-ordination which children must acquire in their reading, and it certainly should be taken into account by teachers of the subject.

Girls are in many cases better readers than boys. This has usually been thought due to indifference on the part of the boys, but the sug-

gestion here given is that the boys do not have certain co-ordinations of the respiratory organs which are essential for good reading. This suggestion will apply equally well in the teaching of music.

The increase in the height of the curves for both the boys and girls indicates that the kind and amount of expression to be expected of children will vary from year to year.

The statement is made by certain critics of methods of teaching primary reading that the subject as now taught produces a great amount of stuttering among children. The irregularities in the breathing of the boys while reading indicate a tendency toward stuttering, which good teaching should take into consideration.

Future Work.

The work in the future will be done with two pneumographs. One will be placed on the upper chest and a second on the abdominal region, so that both types of movements may be considered. All the children tested last year will be tested again this year to see what effect a year's physical development and practice in reading has had upon their breathing. A correlation between tone of voice, accent, inflection, etc., and different types of breathing will be attempted.

Some curves have been made for silent reading. It appears that such reading has a decided effect upon the breathing curves, in that the large waves are made up of a continuous series of smaller waves. This phase of the work will receive careful attention.

High school pupils will be studied so that the two parts of the present study may be connected. It will also be possible to carry the investigation into the grades below the third.

It is realized that the manner of dress has a certain effect upon the breathing of both adolescent girls and women. An attempt will be made to determine the nature and the amount of this effect.

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THREE PHASES OF THE FIFTEENTH INTERNATIONAL CONGRESS ON HYGIENE AND DEMOGRAPHY.

At the Fifteenth International Congress on Hygiene and Demography, held at Washington, September 23-30, three sections were of especial importance to the educational world. Even the most impatient reformer must have felt the keenest satisfaction in the representations there of eugenics, sex hygiene and mental hygiene. So

markedly important and so earnestly attended were these phases of the work of the Congress that we venture to predict that another year will not see them relegated to sub-sections on the programs and to odd corners in the lecture halls. The public exhibit which was held for three weeks in conjunction with the meetings of the Congress probably was the most effective educational exhibit ever held in this country. At this exhibit the American Federation for Sex Hygiene was allotted space that was no small percentage of the total floor space of the Red Cross building. The eugenics exhibit was managed in connection with that for sex hygiene, a happy combination and one that proved most valuable. The exhibit for eugenics consisted chiefly of charts and diagrams of the current theories of eugenics, accompanied by references to Galton, Darwin, Mendel, et al., and culminating in the charts showing the heredity of defects. The sex hygiene exhibit showed by slides, charts and models the dangers of sexual immorality, the need of instruction, and the methods of instruction. It was commonly remarked that whereas five years ago such an exhibition would have brought its originators into the courts, now it was attended by people of both sexes, influenced by an earnestness far removed from morbidity. The value of the exhibit was enhanced by the distribution of literature fairly representing the best thoughts on sex hygiene. One entire lecture-room was given over to lectures and talks on this subject. Other lectures, illustrated by moving pictures, showed the evolutionary processes in reproduction. These lectures were often supplemented by more important lectures in the large lecture hall of the building, which each time was taxed to its capacity by an interested (not curious) audience. At the official meetings of this subsection of the Congress the quarters were painfully inadequate, both for sex hygiene and for eugenics. All phases of the work of these sections were well reported by the newspapers of Washington.

The section on mental hygiene received its usual space in the Congress, and more than was supposed to be its fair share of space at the exhibit. We should feel our indebtedness in this respect to Dr. Schereschewsky, director of the exhibit, and to the gentlemen of the New York State exhibit. No small share of the success of the entire exhibit was due to Dr. Schereschewsky, who was particularly alive to the importance of and the advance in those sciences which are fundamentally social. Of noteworthy interest were the special

exhibits of the recent progress in the studies of feeble-mindedness, represented by material from the Training School at Vineland, and from the Minnesota School at Faribault. Dr. Goddard of the former and Dr. Rogers of the latter institution spoke effectively to interested audiences at the exhibit lectures. Dr. L. F. Barker, in his chairman's address, presented succinctly to the Congress the present status of the study of feeble-mindedness. At the subsection on eugenics addresses were made by such men as Grüber, Davenport, Saleeby and Bigelow. Venereal disease received considerable attention under the section for military hygiene. School hygiene was well represented in an extensive and varied program, including the subjects of sex hygiene, child hygiene, hygiene of the school proper, and medical inspection.

A feature of the exhibit, and a phase of mental hygiene that we think will take some place in future congresses of this sort, were the exhibits of mental tests as represented by the Cornell University School of Education Exhibit and that of the Child-Study Laboratory. The Cornell exhibit displayed the apparatus and methods of experimental educational psychology, particularly featuring the Binet tests. This exhibit was considered of sufficient importance to deserve an "award of merit" from the judges of the exhibit. Stoelting apparatus was on demonstrational display in charge of a representative from the Cornell education laboratory. Demonstrational Binet tests were conducted and explained to interested visitors, children for the tests being picked up at random about the exhibit. A demonstration lecture on Binet tests was given in the exhibit lecture hall. (Credit should be given to the New York State Committee for financing the Cornell exhibit.)

The Child Study Laboratory, an exhibit supported by private subscription, gave a demonstration of clinical study of children. Children were brought in by arrangement with the Washington schools and submitted to anthropometric, medical and psychological examination. Professor Bassett conducted many of the Binet tests, using the Huey modification.

Mention should be made of the various exhibits for school hygiene and for medical inspection. Dr. Dresslar of the United States Bureau of Education had an interesting exhibit of collapsible models of rural school buildings. These were complete miniatures in cardboard which could be sent through the mail to school boards con-

templating construction of new buildings. Dr. Dresslar also had on exhibition various types of window shades and a new idea in the shape of glass blackboards.

The exhibit played no small part in the importance of the Congress. It was as nearly ideal as so enormous and widely representative an exhibit can be, and we feel sure that its influence will be felt throughout the country. From Washington the various exhibits have been carried to their respective States, so that there is almost an epidemic of exhibits now operating throughout the country. New York State has planned a methodical exhibit campaign. These exhibits must have an important influence on the public at large, coming, as they do, at this time when so much popular interest is manifested in educational matters. The Washington exhibit was visited daily by thousands during the three weeks of its continuance, and included among its visitors practically all of the foreign and American delegates to the Congress, as well as thousands of visitors who came to Washington to attend the meeting of the Congress. The Congress itself was excellently attended, and the trend of the discussions was most gratifying in the progressiveness manifested and in the desire for unification in all the branches of science represented. Most of the foreign delegates purposed visiting American institutions, and the stimulating effect of their visits will be hard to estimate.

Vineland, N. J. E. A. Doll.

MENTAL TESTS AT THE MENTAL HYGIENE CONFERENCE.

Of the many scientific conferences held in such numbers this year in the United States, the recent mental hygiene conference at the College of the City of New York, November 8-15, is of particular interest to readers of this Journal. The conference was conducted by the National Committee for Mental Hygiene in co-operation with the Hygiene Committee of the New York State Charities Aid. The meetings of the Conference were adapted to special audiences, such as general-public meetings, nurses' meetings, physicians' meetings, college men's meetings, college women's meetings, and parents' meetings. The addresses were delivered by such speakers as Dr. L. F. Barker, Dr. T. W. Salmon, Dr. A. Meyer, Prof. R. S. Woodworth and Mr. Homer Folks. Papers were read on various subjects allied to insanity, such as mental disease, psychiatry, relation of immigra-

tion to insanity, alcohol and insanity, heredity and insanity, and other such topics. The meetings were well attended by the public and by professional men, and at one meeting there were present many delegates to the Clinical Surgeons' Conference, which was then in session in New York. It is estimated that at least 25,000 attended the exhibit and lectures.

In connection with the Conference there was held an educational exhibit, which was substantially a portion of the New York State exhibit recently shown at the Fifteenth International Congress on Hygiene and Demography. Of particular interest was the exhibit sent from the Department of Research of the Training School of Vineland, N. J. This was practically the same as the Cornell exhibit of educational psychology, also held at the Fifteenth International Congress. The feature of the exhibit was the Binet testing, and the intense popular interest displayed in the work was most encouraging. The exhibit and the testing were in charge of the assistant in psychological research at the Training School, who examined children brought in by interested parents. The purpose of the testing was to make clear to the public the nature and administration of the tests, and the importance of such public demonstrational work should not be underestimated. If the public can see such testing done by competent experimenters, well-versed in psychology and well-trained in the Binet tests themselves, it is to be expected that they will form independent opinions as to their value, and also that ignorance concerning the tests may be removed. In the face of the adverse criticism of insufficiently experienced writers whose mere names carry some weight, it is important that the public be informed under the best conditions.

Considerable effort was made to have accurate reports published in the newspapers, and this was attended with some success. The children examined ranged from defectiveness (including a Mongolian idiot and a number of feeble-minded) to one child four years above normal (a girl of eight). A few cases were discovered of children who had been coached in the tests. These were easily detected and properly placed by alternative tests or some slight disarrangement of the ordinary test.

E. A. Doll.

Vineland, N. J.

ABSTRACTS AND REVIEWS.

SOME RECENT LITERATURE ON CRIMINOLOGY.

1. Gina Lombroso Ferrero. *Criminal Man According to the Classification of Cesare Lombroso.* New York: G. P. Putnam's Sons, 1911. Pp. xx, 322.
2. Hans Gross, J. U. D. *Criminal Psychology: A Manual for Judges, Practitioners and Students.* (Translated from the fourth German edition by Horace M. Kallen, Ph.D.) Boston: Little, Brown & Co., 1911. Pp. xx, 514. $5 net.
3. Charles Mercier. *Crime and Insanity.* New York: Henry Holt & Co., undated. (No. 17 of the Home University Library of Modern Knowledge.) Pp. 255.
4. C. Ainsworth Mitchell. *Science and the Criminal.* Boston: Little, Brown & Co., 1911. Pp. xiv, 237.
5. C. Bernaldo de Quirós. *Modern Theories of Criminality.* (Translated from the second Spanish edition by Alfonso de Salvio, Ph.D.) Boston: Little, Brown & Co., 1911. Pp. xxvii, 249. $4 net.
6. Raymond Saleilles. *The Individualization of Punishment.* (Translated from the second French edition by Rachel Szold Jastrow.) Boston: Little, Brown & Co., 1911. Pp. xliv, 322.
7. Frederick Howard Wines, LL.D. *Punishment and Reformation: A Study of the Penitentiary System.* (New, enlarged edition.) New York: Thomas Y. Crowell & Co., 1910. Pp. 387. $1.75 net.

The technical problems of criminology naturally lie somewhat outside of the province of a journal devoted to educational psychology; at the same time they do involve numerous problems of applied psychology, while the points of contact between them and the problems of the educator are by no means few when we bear in mind the questions that arise in connection with moral training and the possibilities and limitations of meeting and of overcoming criminal tendencies by educational institutions and measures of various kinds. For

these reasons we devote attention to a few of the many books on criminology that have appeared during the past few months.

Nos. 5, 2 and 6 of the above list are the first, second and fourth, respectively, of a series of nine translations of important foreign treatises upon criminology, now in process of publication under the auspices of the American Institute of Criminal Law and Criminology, and known as "The Modern Criminal Science Series."

In *Modern Theories of Criminality* (5) the reader will find a general survey of the field. In the first part Senor de Quirós gives an account of the origins and development of the science. These origins he finds in the occult sciences (precursors of criminal anthropology), in psychiatry and in statistics. He shows the parts played by the "three innovators," Lombroso, Ferri and Garofalo, and gives a readable, if somewhat sketchy, description of various theories, anthropological and sociological, of the nature and causes of crime. In the second part the rise and development of criminal law is treated, with special reference to indeterminate sentence, probation, the juvenile court, the reformatory, etc. In the third part scientific investigation of crime is explained, means of identification, the value of evidence and testimony, etc.

In Gross' *Criminal Psychology* (2) is found a book of very different caliber. It cannot be said, perhaps, that Gross has in every instance shown himself completely in touch with recent work in psychology, but his general range of knowledge is extraordinary, and his book is easily the most authoritative in its field. The general plan is to divide the subject into two parts—the first on the mental activities of the examiner, the second on the mental activities of the examinee. The problem of Part I is to set forth the difficulties, problems and precautions which concern the judge when taking testimony. There is an extended discussion of the outward expression of mental states, including some principles from Darwin's *Expression of the Emotions*." Eighty pages are given to the problem of drawing inferences from the material presented, with interesting discussions of proof, mistaken inferences, causation, skepticism, probability and chance—all of them in a domain of applied psychology that stands much in need of presentation in lucid form for general readers. The problem of Part II is to set forth general and special conditions which affect the giving of testimony, with special reference to the testimony of old people, of women and of children.

to illusions and hallucinations, and to the effects of sleep, dreams, intoxication and suggestion. The book is supplied with two bibliographies and several "introductions."

The book by Saleilles (6) is a translation of a course of popular lectures delivered at Paris in 1898. As the author himself states that these lectures "on many points no longer represent the views of contemporary science," and are of use chiefly as an historical document, we may content ourselves by noting that the chief point brought out is that there are in the main two opposing points of view in the treatment of crime—the one, which he terms the "classical," regards punishment as determined by the objective crime, as a sort of retribution for the damage done; the other regards punishment as a corrective agency, which looks primarily toward the reformation of the offender, *i. e.*, punishment is individualized, adjusted to the nature of the criminal.

Chiefly of historical interest, also is the adaptation by his daughter, Gina Lombroso Ferrero, of Lombroso's *Criminal Man*. It should be understood that Lombroso was the pioneer of modern criminal science, and that his *L'Uomo Delinquente* has never before been rendered into English. Like most pioneers, Lombroso was overquick to generalize: few criminologists now accept even half of his conclusions. But his tremendous zeal and his painstaking inquiries inspired a large number of pupils and laid the foundations for a saner view of crime and the criminal. The translation is of a high order of merit, the volume is attractively gotten up, and the excellent summaries of the various works of Lombroso in the appendix will make the volume worth perusing by anyone who wants to understand the beginnings of the scientific study of crime.

Insanity is so often pleaded as a defense nowadays that the lay public may take some interest in Mercier's little volume (3), which aims to show what crime is, what insanity is, and how the two are related. The author shows how intoxication, feeble-mindedness, epilepsy, paranoia, general paresis and melancholia affect conduct, and presents an elaborate classification (10 pages) of various kinds of crime. When he comes, however, in his final chapter to discuss the nature of responsibility, the critical reader will not feel satisfied with the acqaintance with modern psychology there displayed. In fact, in criminology, as in psychotherapy, educational theory and other kindred fields, one cannot fail to note that many writers who

very plainly are not psychologically well informed undertake without any compunction tasks of psychological analysis and application from which the psychologist himself would shrink.

Mr. Mitchell's book (4) cannot fairly be appraised on this level of criticism, for it is constructed for popular sale and deals with the sort of things that catch the popular imagination and make up the bulk of detective stories—finger prints, handwriting experts, detecting inks, identifying human blood and hair, and includes histories of several notable forgery, murder and poisoning cases. The book is entertaining, though possibly not scientifically reliable.

The last book of our list, Wines' *Punishment and Reformation* (7), a new edition of a well-known book, has peculiar interest on account of the recent death of the author. Mr. Wines was one of the best informed and most respected writers on penology. The pith of the book is an exposition of the value of the "indeterminate sentence." Two new papers are added in this edition, one on "The Treatment of the Criminal" and one on "The New Criminology." We agree with a recent reviewer who characterized this volume as "the strongest contribution of American literature to the discussion of the fundamental ideas of the reformatory system." G. M. W.

Wilhelm Ostwald. *Monistische Sonntagspredigten. Erste Reihe.* Leipzig: Akademische Verlagsgesellschaft m. b. H., 1911. Pp. 208.

Monism as a scientific *Weltanschauung* has had for years its most brilliant expositor in Haeckel, who, when he had reduced the cosmos to a unity of substance, found yet a problem in the nature of substance. Now the great chemist, Ostwald, shaping the world to the principle of the conservation of energy, and using his prestige as a scientist to decide *ex cathedra* the problems in every field of life and living by one measure—"the energetic imperative," itself largely a catchword—chills us with the absolute finality of his dictum and justifies that criticism of monism that already in 1892 Haeckel attempted to defend—namely, that monism does not satisfy the spiritual needs of mankind. A philosophy of life based on a knowledge of nature's laws is in itself not an inconsistency. But a certain arrogance of knowledge, presumptuous hypotheses, forced conclusions, science put into the seat of Yahweh, leave us cold. An unqualified scorn of humanistic culture, called "paper knowledge," as compared

with the real knowledge that science gives, and an inexorable hatred of the church, which seems to confound all religion with the strictest orthodoxy of bygone centuries, show in an excessive and crude form the modern reaction against the overdone classical education and the externalism of religion that have been prevalent in Germany. The "energetic imperative," while immensely valuable as a guide post, hardly allows the mantle of Kant to fall upon the shoulders of Ostwald. Nature loses no energy; perfect machinery transmits energy with a minimum of waste; do thou act also without waste of energy, are the ethics that guide a scientific *modus vivendi*. Though this gospel of efficiency offers valuable suggestions, only a shortsighted psychology can expect it to serve as a religion, and we must acknowledge that these "Sunday sermons" are, at times, quite as dry as the unscientific kind. Inconsistencies abound. Man, though scientifically on a par with other products of nature, alone practices justice and kindness in a natural world of cruelty and egotism, we are told, and we are bidden to put our efforts at the service of our fellowmen and to love mankind more than self. While this is admirable, for a conclusion reached through modern science it sounds strangely old. A respect for technology as putting the acquisitions of science at the disposal of the masses, a scorn for all reverence for the old, as such, combined with a looking into the future instead, and a forced optimism are other significant features of the sermons. The titles cover a wide range of subjects: truth, the origin of evil, immortality, evolution, Tolstoi, the philosopher's stone are a few out of twenty-six. Among the more interesting ones are those devoted to the theory of energy and its application to living and the one on Nietzsche.

Elfrieda Hochbaum Pope.

Ithaca, N. Y.

THE
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EDITORIALS.

JUDGE LINDSEY ON PUBLIC PLAYGROUNDS.

In the *Journal of Education* (Boston), issue of October 31, we find the following quotation attributed to Judge Ben B. Lindsey:

"In dealing with the problem of crime in youth, we shall make progress just in proportion as we appreciate the absurdity of limiting our remedies to the court, the jailer and the hangman. Our plea for public playgrounds is a plea for justice to the boy. We are literally crowding him off the earth. We have no right to deny him his heritage, but that is just what we are doing in nearly every large city in this country, and he is hitting back, and hitting hard, when he does not mean to, while we vaguely understand and stupidly punish him for crime. *Why shouldn't he rebel?* The amazing thing is that he is not worse than he is." (The italics are ours.)

We have the highest admiration for Judge Lindsey and for the great work that he is doing. We have an unshakable faith in his sincerity, and a deep sympathy with the fine altrusim expressed in the above paragraph. He would be the last to encourage boys to break laws that do not happen to suit them. And yet the above quotation, taken just as it stands, implies, along with its altruism, a certain doctrine or attitude that seems to us to be fraught with danger—a doctrine or attitude that has already worked mischief in school government, whatever may have been its influence in civil government.

Why shouldn't the boy rebel? The situation oppresses him. So the industrial situation oppresses a good many people. Shall we encourage them for that reason to play fast and loose with the law of property? The marriage contract oppresses some people. Shall we indorse the doctrine of affinities. Our system of import duties is far from equitable. Shall we palliate smuggling?

The greatest problem of American education today is to correct the most serious defect in our national life—and this defect is disrespect for law. Can we make the next generation law-abiding by encouraging our boys to break laws that do not please them—even when their *dissatisfaction* is thoroughly justified—even when the laws *are* unjust and inequitable? Is not this the attitude that today constitutes the most serious menace to the future of our democracy?

By all means let us recognize inadequacies and inequalities and bend every effort to correct them; but let us do it in the way that an intelligent self-governing people ought to be the first to indorse and the last to abandon. Evils exist, but no existing evil justifies anarchy. Democracy has made many mistakes; but there is only one mistake that will be fatal, and that is to confuse liberty with license—to reason from an equal voice in the making of laws to the "right" to break laws when they fail to please one—even when they oppress one.

THE EFFICIENCY OF THE PLAYGROUND DEPENDENT UPON ITS DISCIPLINE.

And apropos of this matter of public playgrounds, there is one point that needs a greater emphasis than it has yet received. It is not the provision of opportunities for play alone that will solve the problem. Public playgrounds that are unsupervised have been proved to be as bad as, or worse than, no playgrounds at all. This is a clear conclusion from the experience of the first few years, when the movement was advocated simply upon the basis that the above quotation seems to imply—namely, that it is the lack of *room* and *opportunity* for expressing childish energy that has led to the serious situation regarding juvenile delinquency. The playground experience up to date seems to have proved that it is not the playground as such, but the *supervision* and the *discipline* of the playground that exert the significant influence upon self-control and an adequate regard for the rights of others. Play offers unrivaled opportunities for impressing the essential lessons of law and order;

but *play itself and as such is neither moral nor immoral.* Left to its own devices it may easily work evil, as the experience with the unsupervised playgrounds has abundantly proved. With careful supervision its powerful influence may be directed into wholesome channels.

SOME NEGLECTED RIGHTS OF CHILDREN.

What elements of the child's heritage are most seriously imperiled by the conditions of our modern life? Of what paramount "rights" are we depriving the individual members of the coming generation? If the records of juvenile delinquency tell the truth, it would seem that, with the growth of the urban population, there has gone a parallel relaxation of home discipline—and perhaps also of school discipline. The adequate control and direction of childish activities has been neglected. This tendency has been accentuated by plausible but fallacious doctrines of child government. All of these agencies combine to deprive the child of the heritage which is represented by the ideals of obedience, respect for the rights and feelings of others, self-control, and duty.

These ideals have come out of the history of the race through a long and tortuous process; they represent the important resultants of the conflict between the individual and society. In this struggle the rights of the individual in the social order have gradually been recognized; but this recognition does not mean for a moment that these ideals have lost their significance or that their necessity has been outlived. It is only their reference that has been changed. In place of responsibility to a monarch—to a concrete personality—there has developed the responsibility to the people as a whole. In place of obedience to the dictates of arbitrary authority we have substituted obedience to the collective will of society. But this is far from saying that obedience and responsibility have been devitalized. If this is the meaning of democracy, the end of democracy is clearly in sight.

We should conclude, then, that the most important "right" of childhood is the right to correction, to training, to discipline—to the type of education which will impress upon him from earliest childhood the fundamental lessons of the *licit* and the *non-licit*. And we should conclude also that among other forces, *supervised* play will prove a powerful aid in the realization of this purpose. But let us be certain that we place the emphasis where it clearly belongs.

W. C. B.

NOTES AND NEWS.

A short history of the development of high school education in Virginia has been prepared by Prof. Charles G. Maphis, professor of secondary education at the University of Virginia. The amount expended on high school buildings in the State has increased from $45,000 in 1905, to approximately $1,000,000 in 1912, and the enrollment is now eight times as large as it was seven years ago.

A new public Evening School of Industrial Art has been opened in New York City for the purpose of training its pupils under the actual conditions of the trades in which fine craftsmanship is required. Only those will be admitted to this school who are now actually engaged by manufacturers in the work of drawing, color and design in carpet and textile weaving, the working of metals and jewelry, carving, staining glass and other decoration.

The State of Minnesota has engaged Dr. Ernest B. Hoag, a health expert, to travel about the State and demonstrate to the citizens that rational conservation of the mental and physical health of children is possible and practicable with the means already at hand. Three plans are proposed: (1) Organization with a medical officer and a nurse, or nurses; (2) organization with a school nurse or nurses only; (3) organization by the employment of a simple non-medical health survey on the part of the teacher only. To make it possible for every community, however small, to possess the necessary technical knowledge, the State Board of Health will maintain at the state capital a "clearing-house of information concerning child hygiene, medical supervision, the teaching of school hygiene, and the like."—*Science.*

The college and university teachers of education of the State of Pennsylvania have organized an association, which held its first meeting at Harrisburg December 27, 1912. The program was as follows: "The Present Status of Educational Research," Prof. A. Duncan Yocum, University of Pennsylvania; "The History of Education in the Training of Secondary Teachers," Prof. Henry D. Shel-

don, University of Pittsburgh; "Courses in Education in Colleges for Women," President Anna J. McKeag, Wilson College; "The Function of the College or University Department of Education in Relation to the State Public School System," Prof. Bird T. Baldwin, Swarthmore College; "A Comparative Study of Teachers' Pension Systems," Prof. Raymond W. Sies, University of Pittsburgh.

The college professors of education of the Middle West met in conference at the University of Nebraska, December 19-21, 1912. The general topic for one of the sessions was "The Articulation of Courses in Theory with the Practice of Teaching," and the discussion included the following: "General Discusion of the Topic," Prof. W. A. Jessup, University of Iowa; "The Vitality of Teaching," Prof. W. F. Jones, University of South Dakota; "History and Present Status of Practice Teaching," Prof. B. E. McProud, Nebraska Wesleyan University; "School Observation: What It Should Seek to Accomplish; How to Administer It," Prof. Frank E. Thompson, University of Colorado; "The Aim of Practice Teaching," Prof. Charles Fordyce, University of Nebraska; "Practice Teaching: Its Administration in the University," Dean W. W. Charters, University of Missouri; "Practice Teaching: Its Administration in the Small College," Prof. H. H. Foster, Ottawa University; "The Relation of Courses in Methods to Practice Teaching," Prof. C. H. Johnston, University of Kansas.

Prof. Charles Hughes Johnston's book on "High School Education" is being translated into Japanese by Fumiwo Ando of the Tsuchiura Middle School, Ibarakiken, Japan. Professor Johnston has in preparation a further volume on "Social Aspects of Education."

Prof. Edward L. Thorndike of Teachers College, Columbia University, will give the psychology lectures on the Ichabod Spencer Lecture Foundation at Union College in February and March of this year. The general subject of the lectures will be "The Springs of Conduct," and the special topics will include "Human Instincts: A General View," "The Social Instincts," "The Original Roots of Wants, Interests and Motives," and "The Value and Use of Human Instincts."

CURRENT PERIODICALS.

(In this section only such articles will be noticed as bear directly or indirectly upon the interests of this Journal.)

AMERICAN JOURNAL OF PSYCHOLOGY. Vol. XXIII, No. 4, October, 1912. E. B. TITCHENER. *The Schema of Introspection.* 485-508. This masterly analysis of the methods of introspection is to be heartily commended to the attention of educational psychologists. The emphasis on objective tests in education should not obscure the fact that all knowledge of mental conditions goes back ultimately to introspection.

CHRISTIAN A. RUCKMICH. *The History and Status of Psychology in the United States.* 517-531. Psychology, as a pure science, shows a noteworthy growth in the past 25 years, yet lags considerably behind other recently established sciences, such as political economy, education, etc.

ARCHIVES DE PSYCHOLOGIE. Vol. XII, No. 46 (May, 1912). O. DECROLY AND J. DEGAND. *Observations on the Development of Ideas of Continuous and Discontinuous Quantity in the Child.* 81-121. A detailed, analytical study of the development of ideas of number, size, length, etc.

EDM. CRAMAUSSEL. *The Sleep of a Small Child.* 139-189. An extended experimental study of the depth of sleep of a child from six months to one year old, with an evaluation of the results from a psychological point of view.

No. 47 (September, 1912). M. ROD. WEBER. *Is the Reading Faculty Localized?* 305-309. The author accepts the existence of a "reading center or area," but believes that such a center is built up by training, and is not the result of inheritance. He supports his view by citing the behaviour of a patient who was so nearly blind from birth that he had been taught to read not by sight, but by touch. This patient could distinguish large letters, but he could not read the words which they constituted, because he had never had this particular neural association developed by training.

EDUCATIONAL REVIEW. Vol. XLIV, No. 5, December, 1912. J. W. RAYMER. *Advisory Systems in High Schools.* 466-491. Presents the results of a questionnaire investigation to determine how much advice is actually given pupils in selecting their high-school courses, and the manner in which this advice is offered.

THE ELEMENTARY SCHOOL TEACHER. Vol. XII, No. 2, October, 1912. LUELLA A. PALMER. *Montessori and Froebelian Materials and Methods.* 66-79. An evaluation of the Montessori methods by a Froebelian. The author suggests "the feasibility of com-

bining the different materials and methods into one system for the education of little children."

ARTHUR S. OTIS AND PERCY E. DAVIDSON. *The Reliability of Standard Scores in Adding Ability.* 91-105. An important study of Test No. 1 of the Courtis standard scores in arithmetic to determine the value of such scores for the measurement and understanding of the work of individuals. The test was tried on 202 eighth-grade children of the San Jose schools 25 times. Slight modifications were made in some of the trials. The authors conclude that a single trial with such a test affords but a very precarious measure of the ability of an individual.

No. 3, November, 1912. CHARLES H. JUDD. *Initiative, or the Discovery of Problems.* 146-153. Merely to confront a child with a situation involving a real need is not sufficient to rouse him to activity. "The realization of problems is itself a matter of training. A child must learn to see the problems of life." * * * "Most untrained people evade problems rather than develop through their contact with problems."

REVUE PSYCHOLOGIQUE. Vol. V, No. 1, March, 1912. LADISLAS NAGY. *Instruction in Paidology for Educators, Physicians and Officials of Children's Courts.* 3-12. The author rejects psychology as the basic science for education, and urges greater emphasis on the scientific study of the child. He shows the general ignorance of paidology and the need for instruction in the science, and discusses six types of such instruction.

A. SLUYS. *Instruction in Paidology in Normal Schools and Universities.* 12-22. A history of the attitude of Belgian normal schools and universities toward scientific paidology, and recommendations looking toward the introduction of experimental work on the subject.

I. IOTEYKO. *Instruction in Paidology for Teachers and Physicians.* 23-36. An outline of a course in paidology, embracing hygiene, anthropometric measurements, physiology, psychology and pedagogic tests.

GABRIELLE FRANCIA. *Organization of a Paidological Laboratory as an Annex to Every Normal School.* 37-43. Such a laboratory should have at least four rooms—an apparatus-room, an examination-room, a record-room, and a private workroom.

I. IOTEYKO. *The Unification of Terms, Measurements, and Notations in Paidology.* 44-76. A discussion of various aspects of psychological and paidological terminology, and an attempt to establish the limits of the new science.

V. KIPIANI. *The Tropisms of Pupils.* 77-92. An ingenious attempt to carry over the concept of tropisms, as developed by Loeb and applied to the reactions of lower organisms, to the behavior of school children, with especial reference to their reactions to light.

PUBLICATIONS RECEIVED TO DECEMBER 1, 1912.

(Notice in this section does not preclude a more extended review.)

Tsuru Arai. *Mental Fatigue.* Teachers College, Columbia University: Contributions to Education, No. 54, 1912. Pp. 115. $1.

This is probably the most intensive study of mental fatigue that has ever been made. After a splendid historical survey of the subject, the author recounts the results of experiments to determine the change in mental efficiency produced by various types of mental work. Among these was a careful study of the effects produced by the mental multiplication of four place by four place numbers continued for 12 hours without interruption. There was a gradual increase in the average time required for each multiplication, until at the close of the 12 hours the average time was almost double that at the beginning. The feeling of fatigue was only slightly correlated with the decrease in mental efficiency.

George Sidney Brett. *A History of Psychology, Ancient and Patristic.* London: George Allen & Co., Ltd., 1912. Pp. 388.

A most comprehensive and helpful treatment of the subject.

L. Cellérier and L. Dugas. *L'Année Pédagogique.* Première Année, 1911. Paris: Felix Alcan, 1912. Pp. 487.

This publication forms a novel and valuable addition to the list of educational periodicals. Appearing only once a year, its aim is to give a comprehensive survey of the contributions to education that have appeared during the previous year. In the initial volume there are five articles of a general nature, summing up the trend of educational thought in each of the fields considered. These are followed by a pedagogical bibliography for the year 1911, containing 2502 numbers arranged under their appropriate headings, and most of the citations are accompanied by helpful explanatory or critical comment. This feature of the work makes it an invaluable source of reference for the student of education, and performs for education the service which has long been rendered to psychology by the *Psychological Index.*

Herbert W. Conn. *Biology: An Introductory Study.* New York: Silver, Burdett & Co., 1912. Pp. 425. $1.50.

At once simple and comprehensive. Replete with illustrations, easy and fascinating in style, it furnishes the background which

every teacher and superintendent needs at the present time in order to follow intelligently current educational discussions and to appreciate the physical and mental make-up of pupils.

MAX DESSOIR. *Outlines of the History of Psychology.* New York: The Macmillan Company, 1912. Pp. 278.

A handbook admirably adapted as a textbook for class use, and which should stimulate the development of courses in the history of psychology.

WILLIAM P. HASTINGS. *Education: The Old and the New.* Battle Creek, Mich.: Published by the author, 1912. Pp. 299. $1.

This book presents the personal reaction of a veteran teacher to a wide range of educational problems from genetic psychology to industrial training. It makes no claim to scientific treatment, nor is it of scientific value, but it lays much emphasis on health and calls for a sane and rational attitude toward the work of the schools.

M. A. LEIPER. *Teaching Language Through Agriculture and Domestic Science.* Washington: Bureau of Education, 1912. Bulletin No. 490. Pp. 30.

What shall be taught in rural schools? The present monograph is an attempt to center the language and literature work of rural schools in the activities and products of farm life. There has been so little of this done heretofore that an overemphasis of the immediate environment of the child will do no harm, but there is no doubt that such overemphasis is possible. We must not forget that the farmer's life is narrowing at best, and that the only opportunity for a glimpse of the broader world for many farmers' children is through literature.

WILLIAM H. MAXWELL. *A Quarter Century of Public School Development.* New York: American Book Co., 1912. Pp. 429. $1.25.

This interesting volume is a compilation from the reports and addresses of Superintendent Maxwell, and is issued as a kind of "Festschrift" on the twenty-fifth anniversary of his service as superintendent in Brooklyn and New York. The thirty-four chapters present Dr. Maxwell's views on almost every important problem that has engaged the attention of educators during the past quarter century, and show him courageously and consistently standing for the best interests of the pupils. There is a cordial introduction by President Butler of Columbia.

PAUL NITSCHE AND KARL WILMANNS. *The History of the Prison Psychoses.* New York: Journal of Nervous and Mental Diseases, 1912. Pp. 84, xiv. Translated by Francis M. Barnes and Bernard Glueck.

A historical psychological treatment with bearing on prison reform.

BENJAMIN R. SIMPSON. *Correlations of Mental Abilities.* New York: Teachers College, Columbia University: Contributions to Education, No. 53, 1912. Pp. 122. $1.

"This monograph is a contribution to knowledge of individual differences, especially in that complex of qualities which we call 'general intelligence,' and of the means of measuring them. Its special purpose is to determine the *significance* of certain tests by showing what relations they have to one another and to general intelligence in its common meaning."

WILLIAM H. TOLMAN AND ADELAIDE WOOD GUTHRIE. *Hygiene for the Worker.* New York: American Book Co., 1912. Pp. 239. 50 cents.

Teachers, students and workers generally are fortunate in having offered to them this excellent little text on healthful living. Dr. Tolman, the director, and Miss Guthrie, department of research of the American Museum of Safety, have an international reputation in industrial hygiene, and the book has been prepared under the editorship of Dr. C. Ward Crampton, Director of Physical Training, New York City. The style is direct, the treatment is thorough, and the chapters are copiously illustrated.

FREDERIC LYMAN WELLS. *The Question of Association Types.* Reprinted from the Psychological Review, July, 1912. Pp. 253-270.

A study of the material secured in testing the Kent-Rosanoff free association experiment reveals five fairly definite types of association. They are (1) the predicate; (2) the supraordinate; (3) the contrast; (4) the miscellaneous or internal-objective, and (5) the speech-habit groups.

WILLIAM A. WHITE. *Outlines of Psychiatry.* New York: The Journal of Nervous and Mental Disease Publishing Co., 1913. Pp. 318.

A revised edition. One chapter is devoted to the Binet and Simon tests.

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STANDARDS OF MENTAL EFFICIENCY.

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We need not take any space here to discuss the desirability of norms or standards of mental efficiency. This desirability is recognized by everyone who has recently considered the matter. It is sufficient to say here that the gradation and classification of pupils, methods of teaching and, to a considerable extent, the nature of the curriculum should be based on an accurate knowledge of the mental capacity of the pupils.

The Binet-Simon tests have awakened interest in this country, as is manifest in the recent writings of Wallin (6), Huey (3), Terman (6), Whipple (8) and others. But the interest is chiefly in feeble-minded and backward children, the 4 per cent. at the lower end of the curve of distribution. It is the opinion of the writer that interest in mental tests must be extended to include not only the 4 per cent. at the upper end of the curve of distribution, *i. e.*, the supernormal, but *all* pupils, the normal as well as the subnormal and supernormal. Educational procedure will not be based upon scientific principles until the teachers have accurate knowledge of *all* the children in the schools. From the point of view of school finances alone it

will be quite worth while to make accurate tests of the mental capacity of the children. The financial loss to the State, due to poor classification and gradation, to say nothing of poor teaching, because of inaccurate knowledge of the mental and physical conditions and capacities of school children, is certainly very great. But little investigation is necessary to show that the classification of pupils is based on no sound principle.

If it is worth while to spend money in testing the mentally deficient and providing for them the proper kind of education, it is certainly worth while to make accurate determinations of the normal and supernormal in order properly to classify *them* and to make proper provision for *their* training. For some time psychologists generally have been convinced of this, and therefore recognize the present urgent need of norms of efficiency for the various school ages. Before we can establish norms of efficiency we must agree upon the tests to be used. Now, the determination of the best tests and establishment of norms are both enormous tasks, for the experiments should be carried on in every section of the country and with thousands of children of all ages. This makes the task a national one and must ultimately be done under national supervision.

What Tests Should We Use?

A good mental test must satisfy several conditions. (1) It must test some aspect of mind that is important in learning, either in getting ideas or in forming habits. Memory, association, attention and imagination doubtless have this importance, and we should, therefore, expect, *a priori,* that they should be tested. But we must not rely solely on theoretical considerations, but must determine what tests have the highest correlation with one another and with school progress. For an interesting discussion of this point the reader is re-

ferred to articles by Brown (1), Burt (2) and Hart and Spearman (5) in the *British Journal of Psychology.* (2) The test must be simple, easily given, readily understood by the pupils and easily graded. Simplicity is necessary for two reasons. If tests are too difficult and complex, it will take too much time and trouble to give them; teachers would not undertake them. Simplicity is also necessary for accurate grading of the results. During the past two years I have given various mental tests to several thousand school children, chiefly in three St. Louis schools and smaller schools in Missouri. The same tests have been given to students in my classes in the University of Missouri, several hundred in all. My results point, in general, to much the same conclusions that are warranted by the British studies mentioned above. The accompanying table (Table I), showing the intercorrelation of the various mental tests, is pretty good evidence of what the best tests are. The results shown in the table are from tests given with the greatest of care to adults. The tests given to school children, in general, confirm them.

One of the very best tests is certainly a test of logical memory. I have given this test more extensively than any of the others, using the *Marble Statue,* as prescribed by Whipple. There are three bits of evidence that indicate the worth of this test: (1) its high correlation with permanent retention, + .76; (2) its high correlation with other tests, an average of + .29, only two tests giving a higher average correlation with the other tests (see Table I); (3) its high correlation with school standing. Immediate memory, which is virtually learning capacity in the sphere of ideas, is an excellent criterion of permanent retention. In order to determine the relation between immediate memory and permanent retention I gave the immdiate memory test, using the *Marble Statue,* to two schools having about 300 pupils each. The correlation obtained from

TABLE I.—*Showing the Intercorrelation of Mental Tests.*

	Simultaneous adding.	Complicated prose.	Attention.	Association.	Learning.	Rote memory.	Logical memory.	Fidelity of report.	Imagination.	Sentence building.	Word building.	Description.
Simultaneous adding	. .	.21	.00	.43	.76	.25	.21	.44	.24	.00	.71	.21
Complicated prose	.21	. .	.21	.31	.71	.41	.48	.08	—.12	.24	.16	—.03
Attention	.00	.21	. .	.01	.47	.33	.00	.07	—.19	.35	.22	.37
Association	.43	.31	.01	. .	.44	.00	.39	.17	.23	—.25	.17	.32
Learning	.76	.71	.47	.44	. .	.44	.55	—.03	—.10	.17	.44	.02
Rote memory	.25	.41	.33	.00	.44	. .	.36	.27	—.13	.29	.27	—.05
Logical memory	.21	.48	.00	.39	.55	.36	. .	.07	—.40	.11	.21	—.31
Fidelity of report	.44	.08	.07	.17	—.03	.27	.07	. .	.37	.12	.21	.21
Imagination	.24	—.12	—.19	.23	—.10	—.13	—.40	.37	. .	—.42	.06	.05
Sentence building	.00	.24	.35	—.25	.17	.29	.21	.12	—.42	. .	.01	—.05
Word building	.71	.16	.22	.17	.44	.27	.21	.06	.01	.01	. .	. .
Description	.21	—.03	.37	.32	.02	—.05	—.31	.17	.21	—.05	.05	. .

NOTE.—Correlations marked (—) are negative; those unmarked are positive.

the results of the two tests was .76, P. E. .02 in one case and .70, P. E. .03 in the other. The retention test was given five weeks after the first test. Permanent retention, other things equal, is a good criterion of the outcomes of teaching. Then, since immediate memory has a high correlation with permanent retention, it follows that immediate memory is a good criterion of the profit a child will get from school work. I have other than inferential ground for this conclusion. I determined directly the correlation between the standing of pupils in the immediate memory test and their standing in school work for the whole year. While there is great variability, the correlation is as high in some grades as + .69. Many tests that I have given my own classes convince me that whenever adequate means of determining class standing are used a high correlation is found between immediate memory and class standing. We cannot expect to find any single test that will give a *very* high correlation with class standing, because there are so many factors besides native capacity that help to determine class standing, ambition to succeed and good habits of study being of great importance. No matter what one's ability, he will not stand high unless he is ambitious and *works*.

Another valuable test, perhaps the best of all, is a test of learning capacity, Whipple's *substitution* test. I used both forms of the substitution test, and in the same way, allowing eight minutes for each. But this time is slightly too long for the upper grades. A better way would be to allow eight minutes for ages up to 10 and five minutes for ages 10 and over. The method of giving the test is to place the blanks and keys before the pupils, and, after explaining exactly what they are to do, have them turn over the papers and begin. If different times are allowed for different ages, then the average number of characters or digits correctly written in a minute could be

taken as the result of the test. Another valuable test is association (Whipple's *Manual,* pp. 313-327), the combined results of the uncontrolled association test and the three controlled association tests. I allowed three minutes for the uncontrolled, 90 seconds for the opposites, 45 seconds for the genus-species, and 30 seconds for the part-whole tests. It would probably be better here also to allow different lengths of time for the younger and older children. The number of associations per minute could be taken as the result, adding the four results to obtain the standing of a pupil in association. In attention I have used the simultaneous adding test and the "A" test. The former is doubtless far the better test, but it is not practicable to give it as a group test. The result given in Table II is from the "A" test, derived by the use of the formula for efficiency. For rote memory I used Whipple's list of words, revised so that it is suitable for all ages. The revised list is given in my *Educational Psychology,* p. 204. For imagination I have used three tests—the *inkblot* test, the *word-building* test, and the *sentence-building* test. The latter seems to have little value as a quantitative test; the inkblot test has little value as a quantitative test, perhaps considerable value as a qualitative test, and the word-building test has a fairly high correlation with the other tests. In Table II the inkblot test is given under *imagination* and the word-building test under *invention.* The method of giving the inkblot test was to allow one minute for the pupil to write the things suggested by each blot. The result in the table is the total for all the blots. Most of the correlations with the inkblot test are negative. The time allowed for the word-building test was five minutes. The result given is the average for the two sets of letters given by Whipple (*Manual,* p. 441).

On the basis of the above considerations, the most promising and available group tests were selected and given to school children.

TABLE II.—*Mental Efficiency.*

BOYS.

Age	8		9		10		11		12		13		14		15		16		17		18		Gen.
	No.	Av.	No.	Av.	No.	Av.	No.	Av.	No.	Av.	No.	Av.	No.	Av.	No.	Av.	No.	Av.	No.	Av.	No.	Av.	av.
Learning	9	27.0	35	27.0	30	27.5	40	34.6	27	39.3	33	39.5	46	46.1	10	46.0	5	47.2	16	49.0	8	48.0	39.2
Logical memory	61	23.9	75	31.0	92	31.0	103	33.2	109	36.5	111	38.5	94	37.5	63	37.4	42	36.6	35	37.1	19	40.7	34.8
Rote memory	5	29.0	30	37.9	30	53.5	50	47.5	56	40.0	56	42.5	55	43.5	35	44.2	36	47.2	29	49.5	11	54.0	44.3
Attention, "A" test	..	...	20	23.3	10	24.4	28	31.6	13	39.0	21	39.0	19	51.1	11	55.0	10	64.1	9	62.0	4	70.5	46.0
Association	10	25.6	37	31.6	31	38.4	37	42.1	21	46.4	48	47.2	32	52.3	12	55.8	17	54.8	16	68.1	8	72.7	48.6
Imagination ink-blots.	2	23.5	20	46.6	25	40.5	45	45.5	21	43.8	39	62.0	12	31.5	12	31.5	12	34.2	14	33.3	11	31.0	38.3
Invention	..	...	17	17.5	11	17.5	19	19.7	16	23.1	14	25.8	21	22.2	18	24.0	16	33.6	21	34.5	11	35.8	25.3
Total mental efficiency	..	25.8	..	30.7	..	33.1	..	36.0	..	38.3	..	42.1	..	40.6	..	42.0	..	45.4	..	47.6	..	50.4	39.5

GIRLS.

Age	8		9		10		11		12		13		14		15		16		17		18		Gen.
Age.	No.	Av.	No.	Av.	No.	Av.	No.	Av.	No.	Av.	No.	Av.	No.	Av.	No.	Av.	No.	Av.	No.	Av.	No.	Av.	av.
Learning	29	20.0	54	31.5	30	31.3	49	38.2	41	44.2	41	46.2	42	48.0	23	46.3	2	50.0	16	46.3	9	48.7	40.9
Logical memory	46	26.7	86	31.8	87	34.3	115	35.6	134	38.0	117	40.1	107	40.2	77	41.0	70	39.7	58	39.4	25	42.1	37.2
Rote memory	16	29.0	38	37.0	37	42.0	67	39.5	64	41.0	59	43.0	78	44.5	49	46.7	63	46.8	51	51.5	20	52.7	43.1
Attention, "A" test	18	16.0	24	28.0	21	30.0	26	38.0	20	45.2	16	51.3	23	55.7	13	68.0	13	70.2	16	62.3	8	64.9	51.3
Association	28	27.6	50	35.7	35	38.7	46	48.5	39	52.6	38	49.6	38	58.3	18	63.3	23	65.6	32	70.9	16	74.3	53.2
Imagination ink-blots.	2	23.5	20	46.6	25	40.5	45	43.5	21	43.8	39	62.0	12	31.5	12	31.5	12	34.2	14	33.3	11	31.0	38.3
Invention	..	...	17	17.5	11	17.5	19	19.7	16	23.1	14	25.8	21	22.2	18	24.0	16	33.6	21	34.5	11	35.8	25.3
Total mental efficiency	..	28.2	..	32.6	..	33.5	..	37.6	..	41.1	..	45.4	..	42.9	..	45.8	..	48.6	..	48.3	..	49.9	41.3

NOTE.—No. = number tested; av. = average mark of children of that age.

Results for boys and girls combined in imagination and invention.

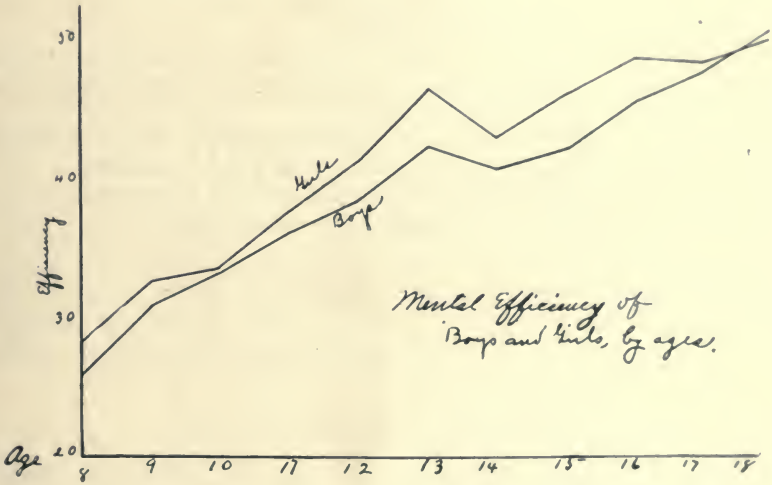
In Table II are combined the results of the various tests, and the average standing for the different ages for both sexes are shown in the lower horizontal columns. The relative standing of boys and girls in a given test can be determined by reference to the averages at the right. The comparison of the two sexes can also be noted by reference to the curves. Now, these figures and the curve are given, not in the belief that they have any permanent value, but as indicating the sort of thing that will soon be a possibility. That we are very nearly able to prescribe a definite and workable system of mental tests is certainly true. It is the belief of the writer that these tests, when once we have them, will be a few simple tests of mental functions as indicated above that can be given to children of all ages, with possibly a different length of time for the older children. With such a scheme we shall be able to compare directly a child's standing in any particular aspect of mind with the norm, and also his total mental efficiency with the norm of the age.

The advantage of the plan here proposed over the Binet-Simon series of tests is that the tests that we propose are group tests and can be administered to all the pupils easily and with accurate results, and, besides, ought to give much more definite information as to the peculiar mental characteristics of the various pupils. Some such scheme as we have outlined will suffice for the school as a whole. The extreme variants, both the subnormal and supernormal, could and should have further and more extensive tests to supplement these.

It will be noticed from the graph that the curve falls from 13 to 14. This is probably due to the fact that there is a partial selection in the subjects. Not many high-school pupils are included in the tables. Many 14-year-old pupils are in the high school. Those that remain in the grades doubtless aver-

age lower in ability than do those that have gone on to the high school. There is, of course, much selection in the later high-school years, 18 and 19. That those remaining in the high school during these ages have higher ability than those that drop out it would be hazardous to say.

It will also be observed that the average ability of the girls is greater than that of the boys. In logical memory, in which the greater number of pupils were tested, there is not a single



exception. The curves based on the averages come together between 17 and 18, but the number tested at these ages is too small to give this any significance. At the explanation of this superiority of girls over boys we can only guess. It may be that girls develop a little faster than do boys at any age of childhood or youth; they would, therefore, average a little better than boys. There is also some reason to believe that girls, when given a task, in performing it work at nearer their maximal efficiency than do boys. Finally, the reader should be reminded again that these tests and tables are to be considered only as a working basis. The writer will be able shortly

to publish directions for performing these tests, and norms based on tests given to several thousand children of each age.

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MENTAL ADAPTATION DURING THE SCHOOL DAY AS MEASURED BY ARITHMETICAL REASONING.—PART II.

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(*Continued from the January number.*)

IV. Third Series of Experiments.

1. *General Plan.*

A third series of experiments was made in an infants' department of a school situated in a rather poor neighborhood in the south of London. The whole of a Standard I class, which contained all the Standard I boys and girls in the department, did the work. All these children were 6 or 7 years of age; the average age was 6 years 11 months, and the experiment began with 56 children. The tests were administered by the head mistress, who had had much experience of experimental work with young children.

2. *The Tests and the Method of Marking.*

Sets of problems were called out, one problem at a time, by the head mistress of the school, and the children wrote down the answers, and the answers only. The following is one such set, given as one of the preliminary tests, on the results of which the class was divided into equal groups:

1. There were 15 flowers in a vase; some were red and the rest were white. If 9 were red, how many were white? (One step.)
2. If there were 6 panes of glass in one window, how many panes would there be in 4 windows? (One step.)
3. Out of 12 plums I eat 2. I share the rest between two boys. If each boy gets the same number, how many does each get? (Two steps.)
4. Four rows of trees were planted, with 5 trees in each row. If 10 trees die, how many remain alive? (Two steps.)
5. A boy plays 3 games of marbles and wins 4 marbles each game. Then he loses 2 marbles. How many has he left of what he won? (Two steps.)
6. A girl threaded 6 red beads on a string and then 4 blue beads. Five of the beads came off. How many beads were left on the string? (Two steps.)

Maximum mark per test = 10.

All the sets of tests were constructed on the same plan. The sums set on every occasion were identical in principle, but the figures and wording varied with each set, the subject-matter of the corresponding problems being never twice alike. The order of the problems was also varied; for example, the type of problem used as number 1 of the first set became number 6 of the second set. The questions contained little, if any, numerical difficulty for these children. If they knew how to work the problems, they were nearly certain to get the right answers. At any rate, we had only the answers to go by, for it would have been absurd to ask these children *how* they did the sums, and to work them in full on paper would have introduced novel features, which I was anxious to avoid. Marks were given in accordance with the scale appended to the problems. Each rational step carried one mark.

3. *Chronology of the Experiment.*

The experiment began on Friday, September 1, 1911, the fifth day after the midsummer vacation. Seven problems were given, only one rational step being necessary for the solution of each problem. These "one-step" problems, however, presented so little difficulty to this class that the results would have been useless for experimental purposes. Accordingly these results were disregarded and sets of problems were used similar to those given above. Four sets of preliminary tests were given—at 11.30 A. M. on Tuesday, September 5; Wednesday, September 6; Thursday, September 7, and Friday, September 8. Though the procedure of writing down answers to problems given orally was well known to these children, they did not appear to settle down into their proper places at once. The marks for the first set of answers were consequently discarded. The preliminary tests, therefore, on which the class was divided, were those of September 6, 7 and 8.

A few children had been lost through absences, but we were able to pair off 25 children in each group. Then three final tests were given on Thursday, September 14; Friday, September 15, and Tuesday, September 19. The exigencies of the school arrangements rendered necessary the unequal intervals between the final tests.

Group A worked their final tests each day at 9.40 A. M., whilst Group B took a Reading lesson in the school hall under their own teacher. Both groups had, of course, worked together for the Scripture lesson, which occupies the first school period from 9 to 9.40 A. M. Then, at 10.25, Group B worked the problems, whilst Group A took the Reading lesson.

No other arithmetical work of any kind was done by either group on the days on which any of the tests were given.

4. *Results.*

The coefficients of correlation between the results of the first and second preliminary tests was + .78, and between the second and third + .78. The correlation coefficients between the results of the first and second of the final tests was + .84, and that between the second and third was + .79.

The total marks of the Group A series correlated with those of the Group B series to the extent of + .99 in the preliminaries and to the extent of + .88 in the finals.

Let me now show the comparative results of Groups A and B. First, I will show them in gross. Group A scored an average mark per child per test of 6.9 (mean variation 2.2) in the preliminary tests and 7.5 (mean variation 2.3) in the final tests, whilst Group B scored 6.9 (mean variation 2.2) in the preliminary and 7.9 (mean variation 2.2) in the final tests.

The group working at 9.40 A. M. improve on their preliminary record 8.7 per cent., whilst the group working at 10.25 improve 14.5 per cent. I will next give the comparative results test by test:

Table V, showing the comparative results of Group A and Group B. test by test, in the preliminary and final tests.

		Preliminary Tests.			Final Tests.		
		1st.	2d.	3d.	1st.	2d.	3d.
Group A.	Av.....	6.6	6.9	7.4	7.4	7.5	7.6
	M. V.....	2.3	2.4	2.3	2.4	2.5	2.4
Group B.	Av.....	6.6	6.9	7.4	7.8	7.8	8.0
	M. V.....	2.4	2.3	2.1	2.2	2.0	2.8

I will next show how far these differences between the results of the final tests were common to the more as well as to the less proficient pupils of the two groups:

Table VI, showing the results of Group A and Group B compared, section by section, in the preliminary and final tests.

Marks for 3 preliminary tests.	No. of children.	Av. mk. for 3 prel'y tests. 11.30 A. M.	Av. mk. for 3 final tests. 9.40 A. M.	No. of children.	Av. mk. for 3 prel'y tests. 11.30 A. M.	Av. mk. for 3 final tests. 10.25 A. M.
28, 29, 30.....	3	9.6	9.8	3	9.6	10.0
25, 26, 27.....	9	8.7	9.3	9	8.7	9.5
18 to 24.....	7	7.0	8.0	6	7.3	8.9
8 to 17.....	3	4.3	4.2	4	4.5	5.0
Below 8.....	3	1.2	1.9	3	1.4	2.8

The differences between the results of the final tests seem steadily to favor the sections of the later working group.

V. Fourth Series of Experiments.

1. *General Plan.*

A fourth series of experiments, now to be described, was carried out with the whole of a Standard VII class, of an average age of 13 years 2 months, in a municipal girls' school situated in a poor district in the southeast of London. As in other cases, a whole class, working under the same teacher and in accordance with the same syllabus of instruction, was set to do the work. Then, subsequently, one of the two equal groups continued the work early in the school session, while the other group did the same work late in the same session, and comparisons were made to discover which was the more favorable time. All the tests were administered by the teacher of the class, who had had a great deal of experience of experimental work with children.

2. *The Tests and the Method of Marking.*

We began the experiment with a set of problems which were too easy, and the results had to be discarded. The first set of problems actually utilized was as follows:

1. The charge for keeping 35 horses for 14 days was £52. At this rate what would be the cost of keeping a horse for one day? (Two steps.)

2. How much money should be paid to a blousemaker who works for seven hours a day for six days if she is paid 4d. a dozen for making blouses and makes three blouses in an hour? (Four steps.)

3. A woman had £84, with which she bought a piano, a bicycle and a ring. The ring cost twice as much as the bicycle and the piano twice as much as the ring. What did each article cost? (Seven steps.)*

4. A draper has 18 boxes, each containing 90 reels of cotton. Each reel holds 250 yards. How many aprons can be machined from this amount of cotton if the amount wasted is 40 yards and it takes 37 yards of cotton to do 36 yards of machining? On each apron there are nine yards of machining. (Six steps.)

5. Every five trees in my orchard yield 320 pounds of apples. I have eight rows of trees, with 15 trees in a row. The care of each tree costs me 3s. a year, and I want to make a profit of £100 on the whole orchard. At what price per pound must I sell the apples in order to do this? (Six steps.)

Maximum mark = 25.

The girls were required, not to solve the problems numerically, but to write down how they would solve them. One mark was given for every correct rational step which was on the way to a solution by any method. The marks for steps assigned at the end of each problem were assessed from the *general* method of attack. A few clever children, who "telescope" some of the rational processes, of course receive marks on the more generous scale.

All the other sets of tests contained problems identical in *principle* with these, problem for problem, but the wording and numbers were changed, and the subject-matter of the corresponding problems was also changed. Further, the order of the corresponding problems was changed from test to test.

3. *Chronology of the Experiment.*

The experimental work began on Friday, July 14, 1911, at 10 minutes past 10 in the morning session. On this date, and also at the same time on the following Tuesday morning, July 18, sets of problems were given which are not shown above. They were found to be too easy, and the results were too high to allow of any subsequent differential improvements to be adequately shown. These results were therefore discarded, but the tests performed a useful function as preparatory exer-

*The children found this sum very difficult, as, indeed, all children tend to do who cannot use algebraic or equational arithmetic. In such cases the sum has to be worked as a problem in shares. I incline to regard the final multiplication required of the value of the single share as rationally identical with the assessments of the shares before the process of division can be done: but the teacher was anxious that this, being admittedly a difficult problem for these children, should be marked in the highest possible way, consistent, of course, with the general system of marking.

cises, and doubtless "steadied" the preliminary tests whose results we *did* use for the purpose of dividing the class. The preliminary tests proper were given Friday, July 21; Monday, July 24; Tuesday, July 25, and Wednesday, July 26. They were all worked between 10.10 and 10.45 in the morning after short recapitulary lessons involving no arithmetical reasoning. The short oral lessons were, as is usual in English schools, preceded by a Scripture lesson, which lasted from shortly after the opening of school at 9 A. M. to about 9.40 A. M.

On the result of these four tests the class was divided into two equal groups. Children who would be likely to leave during the coming vacation were marked, so that they might be placed in opposite groups and, if possible, be paired.

On July 26 the schools "broke up" for their midsummer vacation. They opened again on August 28, and, after allowing four days for a resumption of general mental adaptation to school work, the final tests were begun. The days of the final tests were Friday, September 1; Monday, September 4; Tuesday, September 5, and Wednesday, September 6. These were given at 11.25 to Group B and at 10 A. M. to Group A. Whilst Group A were working their tests, Group B were studying Geography from their books in another room under another teacher, and whilst Group B were working the tests, Group A studied the Geography. At 10.45 came the 15 minutes' recreation interval, and after that a short oral lesson differing in subject on different days, but in no case involving any arithmetical computation or reasoning. No arithmetical work other than the tests was done on the dates given above. The children were told before commencing each fresh set of problems how many marks they had obtained before, but no errors were pointed out nor were the marks for particular problems indicated. The geographical work was not questioned on.

4. *Results.*

The preliminary tests were worked by 30 girls. The results of the first test correlated with those of the second to the extent of + .86, those of the second with the third to the extent of + .89, and those of the third and fourth to the extent of + .89.

The correlation coefficients for the final tests were, between the first and second + .91, between the second and third + .95, and between the third and fourth + .91.

The total marks for the A series correlated with those of the B series to the extent of + .97 in the preliminary tests and to the extent of + .81 in the final tests.

The average age for each group was 13 years 2 months.

The comparative results in gross of the work of Group A and Group B are as follows:

For Group A in the preliminary test the average mark per child per test was 13.0 (mean variation 3.8); for Group B it was also 13.0 (mean variation 3.9). In the final tests the corresponding marks for Group A—the earlier-working group—was 14.9 (mean variation 3.6), and for Group B—the later-working group—was 15.7 (mean variation 4.0).

Group A improves 15 per cent. on its preliminary record, and Group B improves 21 per cent. It is interesting to note that nearly the whole period between the preliminary and final tests was holiday.

I will show next the comparative results of Groups A and B, test by test:

Table VII, showing the work of Group A and Group B compared, test by test, in the preliminary and final tests.

		Preliminary Tests.				Final Tests.			
		1st.	2d.	3d.	4th.	1st.	2d.	3d.	4th.
Group A.	Av. mk.....	10.9	12.8	13.3	14.9	14.3	14.6	15.5	15.4
	M. V.....	3.4	3.6	4.5	3.7	3.2	3.8	3.6	3.4
Group B.	Av. mk.....	10.7	12.5	13.8	14.9	14.9	15.3	15.5	17.0
	M. V.....	3.3	3.8	4.0	4.5	3.7	3.8	4.6	3.7

Finally, I propose to show the work of the two groups compared, section by section:

Table VIII, showing the work of Group A and Group B compared, section by section, in the preliminary and final tests.

	Group A.			Group B.		
Marks in 4 preliminary tests.	No. of girls.	Av. mk. per child per test in 4 prel'y tests.	Av. mk. per child per test in 4 final tests.	No. of girls.	Av. mk. per child per test in 4 prel'y tests.	Av. mk. per child per test in 4 final tests.
Over 65.....	3	18.5	19.3	3	18.1	21.6
45 to 65.....	3	13.3	15.7	3	14.6	17.0
35 to 45.....	3	10.3	9.8	3	9.7	11.0
25 to 35.....	2	7.5	15.0	2	7.7	11.6

It will be noticed that the number of children is considerably diminished from the number with which the experiment commenced. There were eight children marked as likely to leave during the summer vacation, and they had been fairly adequately paired in opposite groups. One of the girls, M. R., at the bottom of Group B, who was marked to leave, did not do so, whereas K. H., at the bottom of Group A, also marked to leave, had done so before the final tests were given. M. R.'s results were, therefore, not included in the above summary. The average mark for the third section of Group A contains that of K. W., who was absent from school the first week after the summer holiday, and therefore worked her final tests below the "form" of the other girls. The mark for this section should, therefore, be a little higher. The mark for the last section of Group A is also unsatisfactory. One of these two girls, R. A., worked her four preliminary tests in July with the following results: First test, 6; second, 7; third test, 8; fourth test, 9. In September she worked her four final tests, with the result that she obtained 15, 19, 20 and 17 marks from the first to the fourth, respectively. This is an unprecedented improvement, and it seems likely that some important factor was influencing this result apart from any question of a favorable or unfavorable time; indeed, for Group A, there was practically no change in the time from the preliminary to the final tests.

It is probably worth noting that the factor of habituation, if it operates at all, does so in favor of Group A; yet, notwithstanding this, the advantage in the final tests is found on the side of the later-working group.

VI. Fifth Series of Experiments.

1. *General Plan.*

A fifth series of experiments was carried out in a boys' school situated in a very poor neighborhood in the southeast of London. The work was done with the whole of the First Class, of an average age of about 12½ years. On the ordinary school grading they would have been classified as Standard VI, a, and Standard VII. Work of this kind, dealing with

children of approximately this age and mental level, has already been described, but the present investigation was not superfluous, for the circumstances of these boys were exceptional. Three-fourths of them rose early every morning, and half of them were at work at 6.30 A. M. daily. It would not seem improbable in such cases that the highest mental adaptation would show itself earlier in the morning, and that a time chosen for severe mental work near the end of the morning session at school would be likely to be less favorable. To test this hypothesis the class was divided into two equal groups on the results of some preliminary tests, which were worked about the middle of the morning session. Then, subsequently, one of the two groups continued the tests as early in the morning sessions as school regulations allow, namely, at 9.40, immediately after the Scripture lesson, whilst the other group continued them late in the morning session, namely, at 11.30. Comparisons between the work of the two groups, when working at the same time and when working at different times, were instituted, as in the experiments previously recounted.

It has been suggested to me that if I had put into one group all the boys who went to work early in the morning before beginning school at 9 o'clock, and in the other group all those boys who did not do so, I should have obtained some valuable comparisons. This might have been so, but I could not, in that case, have worked by the method of equal groups, for of the first ten boys in the class in arithmetical reasoning no less than eight were boys who began their day's work at 6.30 A. M. It is true that the two boys at the bottom of the list also went to work very early; but, on the whole, the greater natural ability of the "working" boys would give them the pre-eminence, whatever time in the morning the work was done. In order, therefore, to get the groups equal, it was necessary to divide the class without regard to the existence or non-existence of early morning work. The teacher of the class was a young man of vigor and capacity. He had had a good deal of experience in experimental work, and all the tests were administered by him.

2. *The Tests and the Method of Marking.*

After one or two sets of problems had been tried unsatisfactorily, the following set was constructed and found successful. Perhaps a word may be of service as to the failure of the preceding tests. The test must be of such a nature that there is plenty of room for improvement, for we are working from a basis of differential improvement, it will be remembered. Therefore, it must be rather hard. But it must not be so hard that the children can do little at it, for in such a case we find them all "slumped" together at the bottom of the lists. Also it is important that the marks shall run gradually down from the best boys to the worst, otherwise it is extremely difficult, if not impossible, to get corresponding pupils nicely paired in the equal groups; indeed, it is difficult to get really equal groups at all. The following problems, however, seemed to be satisfactory:

1. A load of hay costing £5 10s. and 16s. worth of cake last a cow six weeks, during which time the cow gives 3¾ gallons of milk per day, sold at 1½d. a pint. What is the weekly profit? (Seven steps.)

2. A horse and a dog commence running side by side. The horse takes 522 strides in half a mile. Supposing the dog to take 11 steps to every 3 taken by the horse, find the length of the dog's strides. (Three steps.)

3. A man bought 120 cows in Holland, paying £9 7s. each for them. Their carriage to London was one-thirty-fourth of their cost price. He then exchanged them for 105 ponies, which he sold for £13 10s. each. What did he gain? (Five steps.)

4. I buy 325 sheep at 27s. 6d. each and 48 lambs at 15s. each. Just 13 weeks afterwards I sell the sheep at 39s. 3d. each and the lambs at 22s. 9d. each. If the cost of their keep is 6d. for each animal a week, what is my gain? (Ten steps.)

5. A school boy receives 6d. weekly while at school, but he has to pay away 4d. every five school weeks. Supposing there are 40 weeks in a school year, how much will he have had for himself in three years? (Six steps.)

6. There are 1259 men, women and children in a train. The men and women together number 1146; the women and children number 982. How many are there of each? (Four steps.)

The boys were not required to work the problems, but to state clearly how they would work them. Their work was marked in the usual way. Every rational step indicated which was on the way to a correct solution by any method received one mark. If a boy "telescoped" into *one*-step processes which, when analyzed, were really *two* rationally, he, of course, received the marks on the more generous scale. For some

purposes it might fairly be argued that such a boy should receive more than two marks, but the question is of little practical importance so far as these tests are concerned. It will be noticed that the system of marking adopted gives a total mark of 35.

3. *Chronology of the Experiment.*

It has already been stated that several sets of tests were given before we finally found a set which was suitable. This preparatory work, however, was by no means wasted, for the children gained facility, and, what was more important from an experimental point of view, settled down rapidly into their proper places when the actual preliminary tests were given. There were four of these preliminary tests, given from 10.15 A. M. to 10.45 A. M. on Thursday, August 31; Friday, September 1; Monday, September 4, and Tuesday, September 5. The preceding lessons were Scripture and Silent Reading. During the latter lesson the children were acquiring information subsequently tested. There were also four final tests, but in these one of the two equal groups—Group A—worked their tests from 9.40 to 10.10 A. M., whilst Group B "read up" a subject on which, in another lesson, they were required to write an English composition. From 10.10 to 10.45 for both groups, the lessons, though different on different days, were always oral lessons. The recreation interval occurred between 10.45 and 11 o'clock. From 11 to 11.30 the lessons were Geography on Friday, History on Monday and Tuesday, and Physical Exercises on Wednesday. It would probably have been more satisfactory to have moved the lesson on Physical Exercises to the afternoon, but that point was overlooked until it was too late to change the lesson. From 11.30 to 12 o'clock Group B worked the problems previously worked by Group A, whilst Group A "read up" for composition.

The four final tests were given on Friday, September 15; Monday, September 18; Tuesday, September 19, and Wednesday, September 20.

4. *Results.*

The coefficients of correlation in the preliminary tests, worked out from the individual cases by the moment-product formula, were, between the first and second, + .77; between the second and third, + .69, and between the third and fourth, + .77. The corresponding coefficients of correlation between the final tests were + .77, + .93, and + .73.

The coefficients of correlation between the total marks for the Group A series and the Group B series were, in the preliminary tests, + .94, and, in the final tests, + .86.

Three boys belonging to the group working at 11.30 were absent in the final tests, so the work of the three boys who corresponded to them in the group working at 9.40 was omitted. There then remained 13 pupils in each group.

The average mark per child per test for Group A in the preliminary tests was 26.8 (mean variation 3.2), and in the final tests 29.6 (mean variation 3.1); for Group B the corresponding marks were 26.8 (mean variation 3.1) and 29.2 (mean variation 3.0). The group working at 9.40 improved on its preliminary record to the extent of about 14 per cent.; the group working at 11.30 A. M. improved on its preliminary record to the extent of 9 per cent., which gives a difference of 5 per cent. in favor of the earlier working group.

I will next show the comparative work of the two groups, test by test:

Table IX, showing the work of Group A and Group B compared, test by test, in the preliminary and final tests.

		Preliminary Tests.				Final Tests.			
		1st.	2d.	3d.	4th.	1st.	2d.	3d.	4th.
Group A.	Av. mk.....	23.0	26.5	28.1	29.5	27.1	30.4	30.5	30.5
	M. V.....	3.8	4.7	2.9	3.3	4.0	3.4	2.9	3.0
Group B.	Av. mk.....	22.8	26.5	28.4	29.5	27.4	29.0	29.8	30.4
	M. V.....	3.9	4.0	2.8	2.9	3.3	2.8	3.0	2.9

There certainly seems some advantage on the part of the earlier working group, but it is rather undecided, and it may be well to analyze the results, section by section, to see how far it is common to the more proficient as well as to the least proficient pupils:

Table X, showing the work of Group A and Group B compared, section by section, in the preliminary and final tests.

	Group A.			Group B.		
Marks for 4 preliminary tests.	No. of boys.	Av. mk. per boy per test in 4 prel'y tests.	Av. mk. per boy per test in 4 final tests, 9.40 to 10.10 A. M.	No. of boys.	Av. mk. per boy per test in 4 prel'y tests	Av. mk. per boy per test in 4 final tests, 11.30 to 12 A. M.
120 and over.....	3	31.8	33.4	3	31.7	33.1
110 to 120.....	3	28.9	32.6	3	29.0	31.3
100 to 110.....	3	25.8	27.8	3	26.0	27.9
Below 100.....	4	22.3	26.0	4	22.1	25.7

In the case of every section we find the children working their final tests earlier in the morning have made a greater advance on their preliminary work than those working later. It is true that a factor of habituation, if it is operative, would work in favor of the earlier working group, for the arithmetic lesson is usually given at the earlier hour. But, in other cases, this factor, if it exists, has not been able to overcome the advantage consequent upon the greater general mental adaptation of a later hour. It is suggested that the opposite result in this case is due to the fact that no less than 12 of the boys whose work is summarized in the above table began work every day at 6.30 A. M.

VII. Pedagogical Conclusions.

If the conclusions arrived at throughout this series of experiments are well based, a very considerable change in the present arrangements of school time-tables seems desirable. Whereas, in the previous experiment conducted by similar methods,* the results were in agreement with the best current pedagogy, those of the present research are in flat contradiction to it. The earlier in the morning the better is the opinion which governs the place of problematic arithmetic in school time-tables at present.

It is true that in elementary schools in England the first school lesson is Scripture, but that fact is due to historical

*W. H. Winch: *Mental Fatigue in Day-School Children as Measured by Arithmetical Reasoning*, British Journal of Psychology, December, 1911.

reasons, and not because the Scripture lesson is regarded as specially suitable for rapidly producing a vigorous state of general mental adaptation. Then in most cases follows problematic arithmetic.

These experiments seem to indicate that a later hour in the morning would be more suitable, in consequence, most probably, of greater mental adaptation at a later hour in the morning. But in classes containing many children who rise early and go to work before coming to school the present early hour for problematic arithmetic is probably better than a later one. In the cases of those children the maximum of mental adaptation appears to be reached earlier than in the case of children who do not work before coming to school.

THE CHILD'S SPEECH.

V. The Mastery of the Tongue.

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1. The beginnings of articulate speech lie, as has been pointed out, in certain mental predispositions which appear as the correlate of processes of physical development in the child. It is prepared for in the inherited momentum of neuro-muscular organization, which provides the indispensable mechanism of utterance, and in the imperious craving for exercise which accompanies all such processes of functional maturation. With each organ is given an aptitude for its exercise and an occasion for its use.

Speech is thus as natural to the child as flying to the bird; the function in each case rests upon a specific physical basis which is in preparation long before the activity appears. Speech is the medium in which the child's spirit is to live and move. It envelopes him as the air surrounds the nest. While as yet he knows nothing of its import, this significant medium subtly stimulates and excites him. As the young bird half rises in the nest when the breeze stirs his feathers, and his wings quiver with anticipated flight, so does the child respond to the speech of those about him and thrill with awakening utterance long before its forms have been apprehended. In a dumb, confused way he finds himself from the outset at home in this new world, for satisfaction attends the exercise of any native power.

This group of inner factors is supplemented by a system of stimuli which the world about him affords. The child is prompted to speak by urgent practical motives as well as by the esthetic rewards which successful utterance brings. He craves speech, and at the same time it is demanded of him; he is constitutionally prepared to exercise it, and its practice

is incessantly thrust upon him. Under such conditions progress should be rapid and attainment high. The greatness of the child's accomplishment in the acquisition of speech can, indeed, scarcely be exaggerated, and the swiftness of his advance from infancy often leaves the observer breathless, but the extent of the period which is occupied by the process and the varied and persistent nature of the attack which the child makes upon its difficulties are sometimes greatly underestimated even by those who are more directly interested in his development.

2. Before the end of the first month the infant shows clearly marked interest in sounds at large, and in the course of the second month his study of speech may be said to arise. Early in that period he begins to watch the face of the speaker, moving his own lips the while and shortly making responsive sounds. During the next two or three months this activity undergoes a rapid development, spontaneous variation supplementing direct imitation, so that by the beginning of the fifth month the child has commonly uttered most of the sounds of his mother tongue. During the second three months of this first half year the child's inarticulate cries have become the conscious means by which a number of specific needs are indicated and their satisfaction secured. Early in the second six months the substitution of articulate sounds is already under way, and before the close of the year his speech attains the stage of combined phrases.

It is during this second half year that the habit becomes prominent of stringing together a chain of syllabic sounds in rapid and repeated utterance, often so fluent and melodious as to form a charming imitation of intelligible speech. At the same time it is as true that the child is sparing of speech at this age as that he is prodigal of sounds. Words do not now form, as they characteristically do for the adult, a running commentary upon his own actions or thought. He breaks silence only under the tension of feeling or in active emergencies.

Words have another value which in individual development is prior to their utterance. They are names—means of identifying things—but to know the name does not necessarily mean

doing anything to the object or with it. It is a mark, one of many, by which the thing may be indicated when present or recalled in its absence. Before he thus uses them himself the child shows his familiarity with the names of many objects, and he understands much of the speech he hears before it becomes a habit of his own thus to describe the things with which he deals or to formulate his purposes verbally. While the primacy of understanding in the acquisition of speech is clear, it should also be remembered that the margin of individual variation between the two phases is great, and that fluent utterance may be considerably delayed without becoming indicative of any abnormal condition of speech or backwardness in general mental development.

3. Even when the habit of utterance has been established—that is, when it has become a custom for the child to describe his experience and formulate his purposes in verbal terms—his expression is still beset by many obstacles. He is struggling with a medium of expression which not only presents mechanical difficulties in the complicated process of utterance, but involves an even greater initial problem in the intellectual formulation of experience which conditions it. The child is learning to think as well as to speak, and perplexity in the one case shines out as luminously in his halting utterance as incoordination in the other. The correlation of these two facts should never be forgotten. The child must learn to think in order that he may speak, yet articulate utterance is itself the very means by which in general he clarifies and fixes his own meaning. The nature of the underlying thought is thus fundamental to the character of human utterance. If the child is to speak intelligibly, he must be taught to think clearly. That desideratum once secured, appropriate expression may almost be said to follow as a matter of course, for clear, accurate thought will always find some form of simple and direct speech in which to clothe itself.

Nevértheless the history of articulate expression in individual development is long and complicated. As a specific function it is part of systemic development, and the status of general psycho-physical organization in the individual has a significant bearing upon its course. In itself it is a complex

process involving sensory perception as well as muscular control, so that articulation cannot properly be considered by itself. Further, the use of the imagination, as well as the immediate interpretation of sensory facts, is involved both in the understanding and the use of human speech. Finally, in the course of its establishment articulate speech appears as but one element in a manifold system of materials upon which the child freely draws in making his meaning plain, and these supplementary activities modify and may definitely retard the progress of speech itself.

4. It must be remembered that the acquisition of the capacity for articulate speech is only part of a more general process, the full story of which includes both the development of general voluntary control over movement and the maturation of intelligence in imaginative and reflective activities alike. In every field development is going on along with that in speech, and these advances reflect an essentially unitary progress. Children often write incorrectly the sounds they have difficulty in speaking. Stammering and stuttering are much more frequent among boys than girls, and a similar predominance of ataxic writing is found in their exercises. The child that stumbles in his speech is clumsy in other ways as well. Stammering is associated with a general tendency to blustering. The precocity of speech in girls is but one phase of a superior neuro-muscular organization in general.

The development of voluntary motor control in the body at large follows a similar course to that of speech, and reflects the same stages of development in intelligence. Random movements of the hands, for example, are followed first by clutching when objects come within hand-grasp, and the latter by active, though at the outset vague, movements of reaching and exploration which come more and more under the direction of the eyes as associations are formed and attention defines itself. The movements thus made are at first elementary. The body as a whole is rolled toward its object or merely stimulated to pervasive trembling by its presence. Later the hands are stretched to grasp, and the feet, pushing or creeping, help the body toward its goal. The grasping is at first clumsy, but one after another thumb and fingers are sep-

arated from the elementary fist and receive opposed and independent motions. By the eighth month the hands are used separately. One group of fingers is capable of holding to an object, while another, with the thumb, feels for a different one. The use of instruments appears, such as reaching with a spoon, and the child begins in a variety of ways to imitate his mother.

In all these aspects alike the main features of development are reflected. The elements of movement are being mastered through repetition and combined in groups and series. The field of sensory complexes is organized and associated with adaptive reactions. Attention is sharpened and memory enriched, providing a basis for the practical use of the imagination, and with the rise of constructive activity comes an increasing variety and freedom in the child's expression. Speech, indeed, may be said to represent the significance of this whole process, for in it the individual sums up his knowledge of the objective world and through it he makes articulate his own ideal and practical ends. In all cases which present special deficiencies in speech, therefore, it is important to study the condition of the child's neuro-muscular organization at large and to stimulate his mental development by general exercises instead of confining attention to speech co-ordination alone.

5. The latter process is in itself one of extreme psychological complexity, and the conditions under which it arises are such as to increase rather than lessen the intrinsic difficulties which it presents. The child, in the first years of speech, is learning new words very rapidly. These are often long, or contain difficult combinations of sounds. As he hears them they are spoken rapidly and in continuous discourse. In his attitude attention to sense rather than to sound is characteristic; perhaps never, under natural conditions, is attention directed to the sound alone. If the child repeats the word, he is likely to do so not in isolation but as part of a context, all of which claims his attention. If reproduced alone, he must still rely upon memory of an experience of very complex character. If he is to reproduce the word, he must recall it as a whole and depend upon this memory for both the specific

sound-form of its constituent parts and for their serial order in the word-whole. In doing so the movements of the vocal organs in forming any given part of the word may be modified by the influence of a movement just made or by that of a movement about to be performed.

What wonder, then, that the child, eager to speak, caring always for his ideas and their expression, not for the form of his speech as such, should fall into confusion in his articulate utterance and thereby introduce many characteristic modifications into his speech. The whole neuro-muscular mechanism upon which speech depends is in unstable equilibrium. It has not yet established fixed habits of functioning, and is subject to manifold irregularities. All forms of mental shock or tension disturb it, such as fear, embarrassment, fatigue, etc., and every intellectual difficulty arrests its orderly course. Thus out of the natural processes of development incoherencies of speech in many forms may arise.

Such temporary disturbances of functional balance, especially if recurrent, tend to set up a nervous habit in which the irregularities of utterance, due to points of increased stress, are exaggerated and fixed. The consequence may be either a persistent type of stammering, a habit of blustering, or even a definite stuttering.

6. The child meets the difficulties of articulation in many ways. Words are transformed in sound or modified in use. Speech is made pliant and expressive through inflection or musical intonation, while varied and abundant gesture supplements the deficiencies of the child's vocabulary. He points to what he wants when the name is lacking; verbs are acted out in pantomime, while other words are spoken; dramatic emphasis corrects the misapplication of terms, and when words altogether fail his meaning is expressed in vivacious pantomime. In all this the child is a natural and admirable polyglot. He has many languages, and draws upon his rich materials of expression with freedom and effectiveness. The very wealth at his command stands in the way of unhampered development in articulate expression.

Advance takes place by gradual transition. The forms of inarticulate expression disappear one by one as the child mas-

Peter Sandiford

ters the elements of speech. Differentiation into successive stages can thus be made only in virtue of the amount of substitution of conventional for natural elements which has taken place at given points in the child's progress. As the range of concepts extends and acquaintance with the system of articulate signs by which they are expressed increases, both the pantomimic accompaniment of speech and the expressive modulation of tones undergo decline. The language of the adult, practically as well as esthetically, must indeed be considered a degraded form of expression in proportion as it has lost the flexibility of childhood. How much the music of speech adds to its intelligibility the adult usually fails to recognize, or he would more seriously strive to preserve this form of excellence which the speaking voice once possessed in such high degree.

7. The difficulties which beset articulation may be classified under many heads. Some sounds are difficult in themselves because their utterance necessitates complex muscle combinations; some are difficult because of their relation to preceding and following sounds in the web of utterance. For the articulation of certain sounds the young child is naturally incapacitated by the imperfection of his vocal organs, while the production of others is being made difficult through restriction of exercise to the limited range of elements which any one tongue comprises. Sometimes utterance is arrested by a permanent defect in co-ordination; at others it suffers temporary derangement from excitement, fatigue, and the like. Each of these difficulties may call for its own individual mode of approach, and methods must be adapted to all such specific differences, but the general character of the child's attack upon his problem may be indicated in terms of a few simple concepts.

In the most general terms every change which the child introduces into his speech may be called a simplification of the form of utterance, but this process appears in a variety of particular modifications. The simplest is omission; the difficult elements are dropped and the child uses only those which he can successfully utter. In some cases words or whole phrases are thus omitted and the sentence form reduced to a substan-

tive, a word of action, or a simple exclamatory term. In others the change affects only the structure of individual words, from which initial or final syllables are dropped, a single impressive sound sometimes doing duty for the whole polysyllable in which it appears.

These omissions, as, indeed, all the modifications here mentioned, leave the substance of thought unaffected. The child commonly means the word—the whole word as the adult utters it—when he thus mutilates its form, and he may intend what the whole syntactic form means for us when he uses a "sentence word." The question is one of difficulty in the motor reaction, not of complexity in the thought it accompanies.

When the sound is attempted instead of ignored, the change introduced may be due to its own phonic character or merely to the context in which it appears. In the first case a simpler sound is substituted for that which presents difficulty. The relation of such pairs of sounds has been exhibited in various physiological alphabets. In the second case one of the sounds in question—not necessarily the simpler of the two—is modified in character because in the succession in which it appears the altered form involves a less complex process of muscular adjustment. For example, it is easier to repeat a sound which has just been uttered, since the vocal organs are already prepared for its reproduction, than it is to pronounce a different one, which of necessity calls for a readjustment of the muscle complexes.

It is this principle which accounts for assimilative changes in human langues as well as for phonic reduplication in the young child's speech. Other modifications than those arising from articulatory difficulties embody the same process of simplification, such as the restriction of utterance to a series of synthetically simple sentences, but these lie beyond the limits of the present paper.

8. In the acquisition of speech all these difficulties must be mastered and the syncopations, assimilations and other mutilations which mark the child's speech eliminated. Ordinarily this rectification takes place unreflectively. The change is a consequence in part of the organic development and organization which is under way, and in part results from the child's

incessant practice of speech in daily life. The influence of the latter factor is not restricted to the period or the occasions when the voice is used as a means of intelligent communication. It begins far back in the first year of life, before the child has anything to say or suspects the meaning of the articulate sounds he hears. The voice is a simple plastic instrument, always ready to hand, which he employs when alone as well as in company in a purely solitary way for his own gratification. In the course of this activity new vocal elements appear, sounds other than those owed directly to the mother's speech. The child's unreflective imitation of the tones of her voice is marked by variations due to the imperfections of his vocal organs, to lack of exact apprehension, to failure of retention and many other causes.

Besides these variations, his original tendency to express himself through the voice in both happy and unhappy experience persists and combines with the reflection of his mother's speech in a new, modified process. These spontaneous expressions, and even the failures in imtiation, become a point of origin for the production of new sound-forms. The child finds utterance indefinitely variable, and in his exploration of the field of its possible combinations a new world of delight is opened to him, with which he more and more occupies himself. The voice is the child's earliest plaything; long before he can use his hands in any constructive work or his mind in dramatic play the tongue has become a companion and a minister in his hours of solitude.

This incessant practice of the vocal organs, not aimlessly as in the first days of infancy, nor imitatively as when he echoes his mother's speech, but experimentally and esthetically, puts him, first of all, in possession of a great variety of articulate sounds which are not simply heard, but known through their production. Further, it puts him in possession of the capacity to make the movements necessary to produce the sounds in question, and thus largely extends the system of movements which are the immediate associates of speech. His utterance is thus greatly enriched, for he has the images of these sounds in mind and can recognize them, and he knows the movements involved in their production and can make them.

9. This unprompted activity of the vocal organs, in the next place, adapts the mechanism for its work in imitating more exactly and extensively the mother's speech forms. It is difficult to estimate in any definite way the importance of the part played by this factor in the development of speech, but the incessant babbling of the child, together with the great variety of combinations to which his activity gives rise, makes it appear that the process is a highly significant element in that stage of his speech development. Organic exercise is the basis of progress in the acquisition of speech, as it is in all forms of skilled movements, and only part of such practice at this stage is got in the actual attempt to reproduce the forms of articulate speech which the child hears.

It is only when especial difficulty exists that technical training in articulation must be resorted to, as when a new tongue is to be mastered by the adult, or the child is hampered by a defective mental or physical organization. In the latter case the method of correction varies with the particular origin and nature of the trouble. If the basis be organic defect, as in hare-lip, cleft palate, and the like, the recourse must be to surgical treatment; it is not a problem that falls within pedagogical method. If the condition be due to imperfect functional development or lack of exercise, stimulation, local massage, and especially systematic exercise of the muscles in respiratory control, vocal scales and production of the elements of speech, should be employed. The earlier all such exercises are begun, the greater their value. Any sound which the child fails to master at the outset is uttered with greater and greater difficulty as time goes by, and unless corrected becomes in the end a chronic defect of speech.

10. The psychological approach to this group of problems must begin with a recognition of the significance of preventive measures. A very great part of the defects which mark human speech is the mere product of unhappy tradition. It is the reproduction and perpetuation of a slovenly social habit of utterance which the child picks up by direct imitation of models whose deficiencies he does not discern and cannot even imagine. To have lived with those who use their own tongue well, because they love good speech and strive for it, is the first

condition of a sound habit and tradition in this respect. When the influence of such direct contact, in reading as well as speech, must be supplemented, the instructor will find at least three aids suggested by the psychological nature of the process involved in articulate speech.

In the first place, the child's attention may be called to the precise character of the sound to be produced as the most general condition of correct representation. Each word is a specific sound-form. To speak it is to reproduce this form with exactness. If the child have not heard the word distinctly, he cannot speak it correctly. If his mental representation of it be distorted, his utterance will reproduce the defect. To correct this initial vice the teacher must pronounce the word slowly, distinctly, precisely, and the child must be brought to listen to the sound, to note its exact character and to fix it in mind. For it is the sound he thus hears, or imagines he hears, which guides him, whether he be aware of it or not, in all his use of the speaking voice.

In the second place, the child's attention may be called to the position and action of the vocal organs in producing the sounds he is trying to master. Each articulate sound is the result of contractions occurring in specific muscle groups combined in definite forms and successions. To alter in any degree the force of these movements, or to vary their order, distorts the form of the resultant sound. Mastery of speech thus implies the ability to make these reactions with complete precision and fluency. If the child can be shown that these movements must be made in just this way if articulation is to be correct, and that if he can only make these movements the right sound will follow, an additional means is given of attacking the problem of defective utterance. There are many devices by which the child may be helped to attain this end, such as watching the teacher while the word is pronounced with special emphasis on the movements involved, observing the position of his own vocal organs by means of a mirror and following visually the motions involved in uttering a given sound, representation by drawings, models, and the like. All such material should be drawn upon in turn according to its value in bringing about the desired result.

In the last place, the child's attention may be called to the character of the sounds he produces when his articulation is defective. It is the form of the resultant word-sound, not attention to the muscular tensions involved in its production, which primarily guides our attempts at vocal imitation. The muscular innervation is continuously modified in one direction or another until the right note is struck or the correct sound-complex attained. In some cases, as in singing, this product is the object of deliberate attention, but in other cases, namely in the use of the speaking voice generally, attention is systematically directed away from this point, since the individual is primarily interested only in communicating his thought. If the sounds he has uttered are fully understood, they have served their purpose, and no incentive remains to examine them critically and modify their character. It is his failure to make his meaning clear, and in a minor degree the amusement or ridicule his mistakes may arouse, which prompts the child to conscious effort in this direction. This element of method presupposes that first mentioned, since a specific defect can be recognized only by comparison with the correct model which the child must carry in his imagination. It is not on that account an insignificant aid in overcoming difficulties of articulation, and its use should be part of the cultivation of speech in the normal child as well as in the defective.

In all such instruction, however, it is practice which finally counts, and effective exercise cannot be got through occasional formal training, but only through habituation in daily conversation to the hearing and use of good speech.

(The End.)

COMMUNICATIONS AND DISCUSSIONS.

A REACTION MACHINE.

The purpose of the apparatus is to afford an easy means of testing the reaction time of an individual to light, sound and touch by a machine which is small, compact and portable.

Most of the reaction machines[1] which are used in connection with the chronoscope are large and cumbersome. Other features of their construction often cause error in the reaction time. The light, which is used as a stimulus, is reflected from a mirror through a lens to a small opening in a screen behind which the S. sits. As the mirror is moved to control the light and to release the pendulum of the chronoscope, which is wired in circuit with it, experimenters not familiar with the construction find it difficult to keep the same adjustment throughout the entire experiment.

The sound stimulus is given by tapping a key. The E. has no control over this stimulus, so probably no two of the stimuli are given with the same intensity. This gives a chance for a wrong interpretation of the reaction, or at least, on account of this difference in intensity of the stimuli, is unfavorable to any comparison of the different reaction times.

The same error may occur in giving the touch stimuli. The E. gives this stimulus by touching the S. on the hand with a pointer wired in circuit with the chronoscope. Here, again, the intensity of the stimuli varies.

As it is necessary to have the chronoscope near the reaction apparatus, it is not unusual for the most careful S. to react to the sound of the release of the pendulum or some other silght sound from the apparatus.

This is avoided by the type of apparatus described here by having the S. placed in a darkened room before the reaction machine while the E. sits in another room before the chronoscope, gives the stimuli, and reads the reaction of the S.

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[1]The apparatus described here was made and used by the author in the department of Orthogenics at Indiana University. The defects named above are especially found in the Bergström type which was previously used.

The apparatus is enclosed in a box 7½ by 9½ by 12 inches. The lower compartment, as shown in the illustration, contains four dry cells. In the laboratory, however, a storage battery or the regular direct current may be used.

The stimulus for light is furnished by a small tungsten bulb[2] (4 c.); the stimulus for touch by a bamboo pointer, and the stimulus for sound by the contact of a bar[3] with the two spools magnetized by the current. As the bulb and the spools are wired in circuit with the chronoscope and the E.'s key, the action of all is simultaneous. The S. reacts to the stimulus by pressing on another key in circuit with the pointer of the chronoscope.

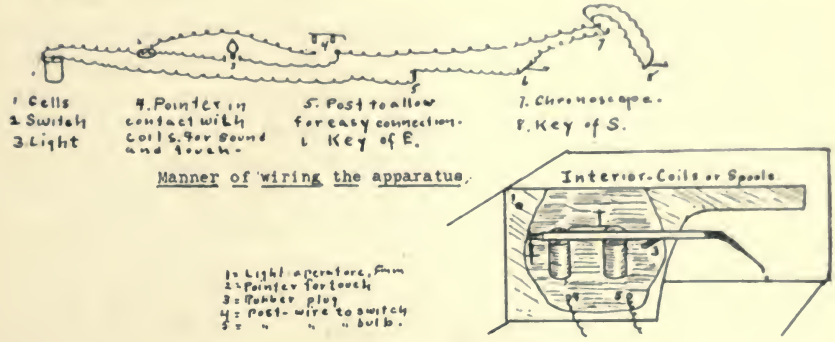
By this arrangement all foreign sounds are eliminated, the action

[2]The bulb is covered with a thin sheet of diffusion glass and the light is seen through an opening 5-m.m. in diameter.

[3]The common electro-magnet.

of all parts of the apparatus is simultaneous, and the intensity of the stimuli is always the same.

Two small coils similar to the spools found in the large electric bells or in the telegrapher's instrument were used in the part of the apparatus which furnishes the stimuli for sound and touch. A bam-



boo pointer attached to the end of the bar in contact with the coils furnishes the touch stimuli, while a small rubber plug inserted beneath the bar prevents any sound. This rubber plug is removed when a sound stimulus is desired. As the piece to which the coil is attached is movable, the pointer can be adjusted to suit the size of the S.'s hand. When a light stimulus is desired, the electric bulb is thrown in circuit with the rest of the apparatus (the touch and sound parts being cut off at the same time) by means of the small switch placed conveniently in the front of the box.

J. E. Evans.

Columbia University.

NEW USES FOR THE EWALD CHRONOSCOPE.

1. The Ewald Chronoscope (Spindler & Hoyer, No. 3, mk. 175) is a finely constructed electric make-and-break counter, with an index hand which may be reset at zero from either direction by the turning of a milled nut. It operates on a current of from 0.2 to 0.3 amp. (requiring a voltage of from 1.7 to 2.5 with the circuit closed), advancing the index hand one point at each closure of the circuit, and

under favorable conditions will work accurately to 100 closures per second. It is thus useful, with a 100-vib. fork, for timing simple reactions; but for this purpose a fork with especially reliable contact mechanism is needed. With an interrupter of slower rate (10 to 75 vibs. per sec.) the Ewald is a simple and easily managed instrument for the timing of association-reactions. An arrangement of the Ewald and accessories for this purpose will be described later.

2. The Ewald is an admirable counter for use with the steadiness tester, tapping board, and other testing devices which require the indication and counting of contacts. Whipple[1] prescribes the use of the kymograph and electro-magnetic marker for these purposes, because the counters of the ordinary type are not sufficiently sensitive.[2] The Ewald, however, is so sensitive that it will record almost any contact which a magnetic marker will record, and at any rate of which any member of the body is capable of moving. Two dry cells give sufficient current. No rheostat is needed, as this is open circuit work, and with but two cells there is no danger of burning the windings of the electro-magnet.

If mere indication of touches on the steadiness tester is required, without mechanical counting, we find a telephone receiver better than a telegraph sounder. One dry cell, of pocket size, operates the telephone very satisfactorily.

3. As a rotation counter, for electric motors, the Ewald is superior to anything we have heretofore used. The worm-gear counters, commonly used, are very unhandy in the timing, and they seriously reduce the speed, making it impossible to use them on small motors for color mixing.

We have a make-and-break mechanism attached to one of Stoelting's motors, and when this is connected in series with a cell of chloride accumulator, a G.-R. rheostat, a Morse key and the Ewald the counting of rotations is simple and accurate. The make-and-break mechanism is (a) a small cylinder, half brass and half rubber (longitudinal halves), attached to the back end of the motor-shaft, and (b) two brass springs, mounted side by side on a block of hard rubber attached to the motor frame, and pressing on the cylinder. Binding posts are mounted on the springs over the blocks. During half of the rotation of the shaft the springs press on the brass part

[1] Manual of Mental and Physical Tests, p. 100, *et seq.*
[2] *Op cit*, pp. 106-107.

of the cylinder, which makes connection between them. During the remaining half of the rotation the springs rest on the hard rubber, and the connection is, consequently, broken. As long as the Morse key is kept down, therefore, the index hand of the Ewald is advanced one point for each rotation of the shaft. This arrangement of apparatus permits the counting of rotations at any rate up to 100 per sec. (6000 per min.) without any difficulty.

KNIGHT DUNLAP.

The Johns Hopkins University.

NATIONAL INSTITUTION FOR MORAL INSTRUCTION — A CORRECTION.

Managing Editor,

Journal of Educational Psychology.

My Dear Sir:—

Under the heading of National Institution for Moral Instruction Mr. Milton Fairchild publishes a large advertising folder. This contains reading matter relating to his lectures, to his lantern slides, and to other matters, together with some endorsements from educators and other men, of his Visual Instruction in Morals. My own name and that of the School of Education of the University of Kansas have been printed and thus exploited in these large folders as representing an official and professional endorsement of the whole scheme of Visual Instruction in Morals. In view of the fact that my name and that of the School of Education is being used despite my repeated and explicit declinations to express an opinion, I hope you will allow me this much of your space to correct a very misleading educational announcement.

Respectfully yours,

CHAS. HUGHES JOHNSTON.

University of Kansas.

ALBERT MOLL. *The Sexual Life of the Child.* Translated from the German by E. Paul. With an Introduction by E. L. Thorndike. New York: The Macmillan Company, 1912. Pp. xvi, 339.

It is impossible to say whether good or evil comes from attempting to popularize the very uncertain knowledge that has been gathered by alienists concerning sex manifestations. To judge by the novels dealing with forbidden sex themes that have appeared on the Continent within the past decade (following the more or less popular accounts of sex perversions written by Kraft-Ebing, Moll and others), one might assume that the recognition given to these morbid manifestations by recognized scientists has encouraged laymen to reject the social disapproval with which these practices have hitherto been stamped. It is reasonable to suppose that, notwithstanding the sincere motive which underlies the scientific discussion of perversions, the mere fact that typical cases are accurately described in books that have a popular circulation will tend to break down the prejudice that society has built up against them. And it is beyond doubt that a vigorous social prejudice is the surest safeguard against any type of moral degeneration. There is a serious problem here that cannot be thrust aside by the dogmatic assertion that "truth never hurts."

The volume before us is relatively, although not entirely, free from the danger spreading contagion through the infecting influence of suggestion. It is evidently written from the most sincere and praiseworthy motives. Certain of its chapters might profitably be read by all who have to do with education of children. The concluding chapter on Sex Education is one of the best discussions of the subject in the literature. Education is conceived as something broader than mere instruction in the facts of sex physiology and hygiene. It includes fundamentally the development of the sentiments of modesty, shame, and disgust. The importance of keeping the attention from becoming engrossed with matters of sex is emphasized, and in this connection the influence of suggestive literature and pictures is helpfully discussed. Moll does not believe that the conventional form of religious education has an appreciable effect upon sex morality. Upon the side of positive enlightenment with regard to sex phenomena, the author contends that the objective phases should be treated first and may be approached in preadolescent years

through instruction in the biological sciences. The subjective phases should not be considered prior to adolescence, and enlightenment here is much better given by the parent than by the teacher. Reference to the danger of venereal infection should be postponed until later. The grave mental disorders that may arise from a morbid conscientiousness regarding normal or inevitable sex phenomena are frequently recurred to by the author, and constitute a part of the discussion that all parents and teachers would do well to read.

W. C. B.

W. PEPER. *Jugendpsychologie.* Leipzig and Berlin: B. C. Teubner, 1912. Pp. VI, 181. Ten Illustrations.

This book is designed by the author as the first introduction to psychology and child study. The pedagogical instruction of the first year, he believes, should have as its chief problem the awakening of an understanding and love for the developing child. The book is especially designed for normal schools (*Seminaren*) and similar institutions. Since it grew out of the author's work as a teacher, he hopes that it may be of practical pedagogical value (*Vorwort*).

The text is divided into four parts, entitled: (1) *Das Kind im Elternhause;* (2) *Die Eroberung der Welt in Schauen und Schaffen;* (3) *Das Kind in der Schule,* and (4) *Eigenart und werdende Persönlichkeit.* Each part is subdivided into a number of chapters. Many of the chapters are preceded by short quotations from various authors. References are also found at the beginning of each chapter. These references are, as a rule, not to standard writers on psychology, but rather to writers on literature. Chapter XVIII, on "*Das Gedächtniss des Kindes,*" might be regarded as a typical chapter. The references are: "Schlosz Voncourt" von Chamisso; Voge, Das Erkennen; Uhland; Eberhards Weissdorn; Chamisso, Salas Gomez; Iphigenie; Tells Monolog; Johannes zweiter Monolog; Keller, Der grüne Heinrich.

A number of questions designed to lead the pupil to a thoughtful consideration of the text and a professional point of view in observing children is found at the end of many chapters.

Dr. Peper has written one of the most comprehensive and readable books on educational psychology that the reviewer has read.

J. MACE ANDRESS.

State Normal School, Worcester, Mass.

LUCIEN CELLÉRIER. *Esquisse d'une science pédagogique. Les faits et les lois de l'education.* Paris: Felix Alcan, 1910. Pp. xiv, 393. Fr. 7.50.

This is a revision and amplification of a thesis submitted to the French Academy of Moral and Political Sciences, and awarded honorable mention by their jury. In his preface the author boldly avows that it is not his purpose to add to the number of "practical" treatises on education already crowding the shelves of our libraries. The book is rather an examination of the basal facts of all education, and attempts to derive therefrom the fundamental principles of educational procedure.

Education is conceived as a factor in the general phenomenon of development, and is defined as "the intelligent and voluntary intervention of parents in the development of the child's mental tendencies, in order that he may be adjusted to that environment which they consider best." There are thus three elements in the educative process: the educator, the subject and the environment. The discussion of the nature of these elements and of their relation to each other occupies the first half of the book, while the remainder is taken up with a consideration of the educator's mode of action and of the object of education.

The method of treatment is strictly deductive, and from the assumed data of the educative process the attempt is made to derive by rigorous logical reasoning the laws of pedagogical science. Consequently the treatment is somewhat formal. Recent studies in experimental pedagogy receive scant attention, and among the writers most frequently quoted are Kant, Herbart, Pestalozzi, Bain, Spencer and Compayré. J. C. B.

GEORGE W. JACOBY, M.D. *Suggestion and Psychotherapy.* New York: Charles Scribner's Sons, 1912. Pp. 355. $1.50 net.

This volume contains two main parts and an introduction. The introduction deals with the advantages and disadvantages of the popularization of medical science. In Part I attention is first given to certain general psychological and psycho-physical principles. What we find here is a passable exposition of the scientific trend of modern psychology, a description of the nervous system that is superior to that found in many psychological texts, and one section descriptive of ordinary, one of peculiar and one of disordered mental activity. The author is evidently more at home in neurology and

psychopathology than he is in psychology. The treatment in some places is somewhat disjointed and not entirely clear. The second portion of Part I sets forth the nature, scope and forms of suggestion, and recounts numerous historical examples of its operation, *e. g.*, wolf-madness, children's crusades, the temple sleep, mesmerism, religious fanaticism in recent times.

In Part II, Psychotherapy, we are first shown why psychic treatment of disease is justifiable, what its dangers are, and how important is the human equation both in physician and patient. The section on "Christian Science, Faith and Prayer Cures" is first-rate. Would that it might be read by all prospective converts to modern supernaturalism! The second portion of Part II deals with special applications of psychotherapy, and is especially pertinent because of its appraisal of current methods. Dr. Jacoby gives a good account of psycho-analysis and the doctrine of mental catharsis, but criticises the conclusions of Breuer and Freud, and holds that their results are forced and their methods impracticable for ordinary use. Mental relaxation and exercise, with positive suggestion, are better and saner methods. Still better is prevention of neurasthenia and other neuroses by psycho-prophylaxis. Neurasthenia is on the increase among children, though not, in Jacoby's opinion, on account of undue exactions of the modern school. At least the average child is not overburdened. For those who are mentally incapable of the normal pace "psycho-prophylaxis must endorse the establishment of special schools,"

While there are numerous points about this volume that would invite criticism were one disposed to estimate it from the standpoint of the professional psychologist, such comments would, perhaps, be ungenerous when the aim and prospective audience are considered. Teachers of psychology can recommend the book to students who are interested in suggestion and psychotherapy, and laymen can read it with profit. G. M. W.

WALTER ALBERT JESSUP. *The Social Factors Affecting Special Supervision in the Public Schools of the United States.* New York: Teachers College, Columbia University, Contributions to Education, 1911, pp. 133.

This is a pioneer study in the field of social education. It includes an account of the social forces, pressures, and sanctions back of the introduction of music, drawing, manual training, domestic science,

physical education, sewing and penmanship into the elementary curriculum. There is in addition to this a brief but important quantitative study of the situation in this country relative to the supervision of these subjects.

In his attempt to explain the operation of certain social forces and influences in education and the enrichment of the curriculum, Dr. Jessup succeeded in establishing, at least tentatively, certain theses. The first thesis is that shifts in our social point of view have been responsible for shifts in our attitudes toward the subject-matter and the methods used in each of these subjects of study. A study of occupational life during the latter part of the last century shows that there was a gradual change from agriculture and commercial pursuits to manufacturing. Parallel to this was the increasing tendency to urbanization. One obvious result of the increased density of population in the cities was the added opportunity for the specialization of labor, and the consequent disappearance of the old apprenticeship system. This division of labor affected the lives of women as well as of men. On the one hand it afforded a multitude of new opportunities for women to earn a wage, and, on the other hand, it released, because of changes in household economics, thousands of girls from the necessities of home duties.

The second thesis is that out of the stresses and strains of such new situations as these were born the sanctions for the new subjects of study. The practice seems to be almost without exception that each of the new subjects was introduced into the schools through the operation of forces and agencies outside the established public school system. Groups of progressive people recognized the necessity and urged the wisdom of providing instruction along these lines long before the teachers in the schools were willing to assume the burdens of them. In nearly every case it was necessary for individuals and non-educational associations to experiment with the new subject; the venture was supported by private funds, and at last, after a public opinion had been created that was so strong that it could not be withstood, permissive authority was given to try the subject in the schools.

The sanction back of nearly every subject of study was the satisfaction of some immediate utility. In every case they were intended to minister to the needs of a special vocation or a special class. It was not until the studies fell under the influence of educators that they received a general educational interpretation.

The third thesis is that the new subjects were made a part of the curriculum in the larger cities before they were made a part of the curriculum in the smaller cities, and in general they were made a part of the curriculum in the smaller cities before they were made part of the curriculum in rural districts. This generalization harmonizes with that well-known sociological principle that the curriculum increases in flexibility and in the variety of its appeals in direct proportion to the heterogeneity and massing of social groups. These larger places became the radiant points of conventional imitations; the current set in to the smaller places from them; and the ideas and practices found there filtered down to the more strictly rural districts with their homogeneous stable populations. It seems to be an established fact that new ideas and new practices tend to appear earlier in the cities and that the old tends to be clung to longer in the country.

The fourth thesis is that the school teachers as a class stood out against the introduction of these newer subjects on the ground that they were not cultural or would interfere with the "regular studies." They argued that the curriculum was already overcrowded, that the fundamental studies were not receiving their fair share of attention, and that they themselves were not prepared to give instruction in the new studies. But the inertia of the teaching population and the crust of conservatism were finally overcome or broken through by a public opinion created by special groups to conserve some public utility not heretofore provided for in the established and traditional curriculum. When the subjects were forced in, the teachers, as a rule, neglected them, and in some cases it was not until heavy obligations were imposed upon them by forces either within or without the school that they made the necessary effort to properly discharge their duty.

The fifth thesis is that after these subjects became a part of the curriculum the teaching force ignored or forgot the reasons that brought about their introduction and contended for their retention on the ground of their mind training value. "The traditions of the school were such that it seemed necessary to look for some occult educational value in order to give sanction to their presence in the schoolroom." The demand for the subject ceased to be considered in light of its origin, but was emphasized in light of the particular faculty it would train.

The foregoing arguments show that the public schools are, after

all, but the plastic instrument of society, now played upon by one force, now by another. It seems that each of the new subjects was designed to instruct a special stratum of society or to satisfy some immediate and specific need, but under the influences of the schoolmaster their purposes were diverted and changed so that they were made to minister to all classes. Outside the school they were utilitarian; inside the school they were cultural. The educational pendulum has always oscillated between these two extremes. Its permanent resting place has not been found; nor will it ever be found, for new wants will continue to arise as society increases in complexity.

It must not be understood that Dr. Jessup utters severe and unwarranted criticisms against the teaching force. Their conservatism has been the check needed for radical outside agencies. Otherwise the schools would have been made the dumping-ground for every pet idea, Utopian scheme or fad that held the passing fancy of any group. School teachers have always attempted to evaluate materials in terms of function rather than in terms of value. A mere common-sense view of the problem shows that both of these points of view are necessary.

School of Education, University of Illinois. LOTUS D. COFFMAN.

FRANK MITCHELL LEAVITT. *Examples of Industrial Education.* Boston: Ginn & Co., 1912. Pp. viii, 330. $1.25.

There is a widespread conviction that the schools ought to offer a more direct preparation for the industrial needs of the community, but just what this preparation shall be is still a matter of much uncertainty. The present volume will furnish valuable aid in clearing up the inchoate ideas of educators and in placing at their disposal a detailed account of what has been attempted in various localities.

The manual-training movement was the first step on the road to industrial education, but partly through the effort to overcome the opposition to the introduction of hand work in the schools, and partly as the result of prevailing ideas of the teachers of manual training, the cultural value of the work was the one that received the most emphasis, and its industrial significance was almost completely suppressed. The history of the past twenty-five years of manual training is briefly but admirably set forth, and the reasons for the reaction against this cultural employment of the hands are clearly indicated.

The demands for a more specific industrial training are reviewed

in chapters three to six. Four different types of demand are considered: 1. The manufacturer, confronted by an abundance of raw materials, deplores the lack of skilled labor, bemoans the inefficiency of his employes, avers that the unions deliberately seek to prevent efficient skilled production, and calls upon the State to provide such training for the youth as to render them industrially capable. 2. Organized labor, suspicious of the efforts of capital to increase the supply of skilled labor, fearful lest manufacturers should secure control of industrial schools and use them to the disadvantage of the union principle, demands that such schools be established by the State so that the workman as citizen may have an equal voice in their administration. 3. Educators, realizing that the present school system fails to minister adequately to the needs of many pupils, and that a large number of boys and girls drop out of school to go to work in lines that offer no future, call for a training that is more closely adjusted to the requirements of modern life. 4. Social workers, brought face to face with the evils of idleness and want, demand that every boy and girl be given such a training as will afford a reasonable prospect of self-support and increasingly remunerative effort.

Chapters seven and eight discuss the revision of educational ideals involved in these demands, and present a plan for immediate reorganization of the school curriculum, while chapters nine to sixteen give an account of the schemes for industrial education already in operation. These include the Cambridge experiment, the St. Louis, Portland, Cleveland, Berkeley, Concord, and Gary systems as examples of complete reorganization; the Agassiz School in Boston, and the courses in Fitchburg, Los Angeles, Seattle and other cities as types of prevocational elementary school work; the Albert G. Lane Technical High School of Chicago as a secondary industrial school; the Milwaukee and Worcester trade schools as substitutes for high schools; the Fitchburg and the Beverly part time co-operative schools; the Cincinnati, Cleveland, and Boston continuation schools, and the various schemes for vocational guidance that are being tried in different parts of the country. A chapter on State legislation and another on the agricultural situation complete the volume.

It will be seen that the book constitutes an excellent compendium of the attempts to solve the industrial school problem in this country. The volume is distinguished by its scholarly treatment, its freedom from bias, and the simplicity and directness of its style. It will be of great value to all who are interested in industrial education.

J. C. B.

THE
JOURNAL OF EDUCATIONAL PSYCHOLOGY
INCLUDING EXPERIMENTAL PEDAGOGY, CHILD PHYSIOLOGY AND HYGIENE, AND EDUCATIONAL STATISTICS

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VOLUME IV FEBRUARY, 1913 NUMBER 2

EDITORIALS.

EDUCATIONAL PROPHECY.

From the earliest times the man who was thought to be able to foretell future events has been looked upon with great respect by his fellows. Formerly this gift was supposed to depend upon the seer's insight into the hidden meanings and purposes of things. Nowadays it is the scientist who has fallen heir to the mantle of prophecy, and popular magazines and books are full of references to "the wonders of Science." And, indeed, it is the scientist who is the true prophet, for he studies facts to find out the relations that are generally valid, and, when he has discovered these relations, he can foretell from a given set of conditions precisely the results that may be expected. His is the genuine insight into the purposes of things. This fact is pretty generally recognized in the physical field, and the scientist is there shown the respect which is his due. But the educational scientist has scarcely dared to indulge in prophecy as yet, so fragmentary is his ascertained knowledge of pedagogical relations and so tentative are his generalizations. It is interesting and encouraging, therefore, to see Professor Thorndike, in his vice-presidential

address at Cleveland, launch boldly forth into prophecy, and claim for the scientific educationist the ability to predict with a high degree of accuracy the outcome of certain pedagogical situations. And this is the thing to which studies in education must ultimately lead. "Will James do well in geometry, will he master Latin, will he become proficient in arithmetic, will he make a good speller?" When we shall have developed adequate scales to measure these abilities, and shall have applied the scales to a sufficient number of pupils under the most varied conditions of instruction, we shall be able to say with a definite percentage of reliability just what prospects James has. Then to the educational scientist will accrue the honor, the distinction, the prestige which have always been the meed of the prophet.

RESEARCH IN SECONDARY EDUCATION.

It is not a little surprising that, with our best trained and most fully equipped teachers going into secondary school work and with the great amount of thought and discussion that is expended on high-school questions, there should be such a dearth of genuine scientific investigation of secondary teaching. We have language conferences and mathematics round tables, and we appoint committees of ten and fifteen to tell us how physics or history should be taught, but of actual scientific study of high-school teaching and quantitative measurement of results there is scarcely a trace. We only succeed in compounding traditions and opinions, and are no nearer the prophet's insight than before. In elementary education there are several vigorous and promising attempts being made to accurately measure the results of teaching. Is scientific measurement more difficult in the higher subjects, or is it true that high-school principals and teachers are more completely dominated by tradition and are less keen to evaluate their teaching in objective terms? Surely there is no more important field for an accurate study of the teaching process than that portion of the public school system in which the mortality rate is highest. We need more tests of secondary teaching, and we need to apply such tests more widely and frequently, for it is in the "testing of tests" that we get our best and clearest insight into the actual conditions of mental growth.

J. C. B.

NOTES AND NEWS.

The report of the National Committee of Fifteen on Geometry Syllabus, which has been under consideration for nearly three years, and which was revised and finally accepted by the N. E. A. in July, 1912, has now been republished in a pamphlet of 80 pages and is ready for distribution to teachers of geometry and all others interested. This report was prepared under the joint auspices of the American Federation of Teachers of the Mathematical and Natural Sciences and the National Education Association. It includes a historical introduction and sections on axioms and definitions, on exercises and problems, and the syllabus itself including both plane and solid geometry. It is hoped by the committee that this report may be of great service to all teachers of geometry, and to this end that it may have a wide distribution among all interested. Copies may be secured gratis upon application to the Commissioner of Education, Department of the Interior, Washington, D. C.

Recognizing the fact that the permanent success of the present movement for industrial and other vocational education depends to a large degree upon the skill and ability of the teachers who have charge of the work, and appreciating the scarcity of well-trained teachers in this field and the difficulty of securing a competent instructing staff, the National Society for the Promotion of Industrial Education has established a registration bureau for teachers of industrial, trade, and household arts. The office will not undertake to recommend individuals for positions, but will constitute a clearing-house for information whereby school officials and members of the society may be brought into touch with each other. For the present members will not be informed of vacancies, but all the information collected by the bureau will be placed at the disposal of school officials, and these may then approach those members in whom they are interested. Requests for information should be directed to C. A. Prosser, Secretary, Room 415, 105 East 22d street, New York City.

Prof. John Adams, in his presidential address before Section L, Educational Science, at the last meeting of the British Association for the Advancement of Science, laid emphasis on the need and the possibility of objective standards in education. We have a great mass of material available for scientific treatment, but as yet it lacks organization. We need more careful, quantitative studies of the facts and the deduction of principles from the facts. The subjective element, the determination of educational policies on the basis of mere unsupported opinion, must give way to objective tests and carefully controlled measurements under experimental conditions. "The hope of the evolution of education lies in experiment."

Students of educational psychology will be interested in Prof. E. L. Thorndike's vice-presidential address before Section L—Education—of the American Association for the Advancement of Science at its recent meeting in Cleveland. The address is printed in full in *Science* for January 24, 1913. Professor Thorndike took as his subject "Educational Diagnosis," and his discussion outlined the development of mental tests and indicated some possibilities of their application in the future. The earlier basis for mental tests—the assumption that by some simple exercise one could determine the excellence of a person's memory, attention, imagination, or what not—has been proven inadequate largely by the use of the tests themselves. In the process of testing the tests the exact relations between abilities began to be revealed, correlations were worked out, and those tests which were significant for the determination of a particular kind of behavior were isolated from those which showed little or no significance. Illustrations of this testing of tests were drawn from recent investigations, and in conclusion the speaker indicated some types of prophecy that are justified by the correlations already established and the exact degree of probability that the prophecies would come true.

The Upper Peninsula (Michigan) Educational Association inaugurated a new movement at its meeting early in October. This was the provision for a bureau of research, for the establishment of which $200 was appropriated. During the coming year the bureau will make an educational survey of the Upper Peninsula of Michigan. The possibilities which this will afford are obvious. The movement

is a good one and worthy to be widely imitated.—*Western Journal of Education.*

Prof. W. H. Heck of the University of Virginia has for several years been making a special study of, and propaganda for, the health basis of education. During the year 1911-12 he was granted leave of absence to investigate school hygiene in New York City, and on his return to the University he inaugurated a systematic campaign representing the University and the State Departments of Health and of Public Instruction. He is now spending four or five days a week in the field, addressing teachers' institutes, mothers' conferences and groups of school children. Among the matters urged are the substitution for the old-time water bucket with the common dipper of either the sanitary drinking fountain or the water cooler with individual drinking cups, janitor service, care of desks and blackboards, the number and use of the recess periods, etc. In Orange County, a fairly typical Virginia county, preparations are being made for a comprehensive survey of the educational hygiene of all the thirty-six schools for white children.

In a recent number of *Science*, J. Madison Taylor, Philadelphia, Pa., makes a plea for the personal registration of family memoranda. Three groups of data are especially to be desired: 1. Antecedent personal history making for knowledge of ancestry and inheritance, including salient characteristics of individuals and the family. 2. Earliest phenomena of growth and development constituting "infant records," which should be carefully registered at the time of observation. 3. Personal history of each member of the family from birth to present age and from all reputable sources; not only of the phenomena of infantile and later development and changes, but also accurate data on physical and other disorders, illnesses, accidents, repairs, corrections, etc. A family record book which would meet popular requirements and also contain the above data is very much to be desired. Mr. Taylor's attempt to arouse interest in this matter deserves commendation and support. It is to be hoped that the day is not far distant when such records will play an important part in determining the attitude of teachers toward individual pupils.

Prof. R. B. von Kleinsmid of the Department of Education and Psychology, DePauw University, has been called to establish a Psychological Laboratory at the State Reformatory, Jeffersonville, Ind. This institution includes those adult criminals which the State deems amenable to reform; the strictly incorrigible adult is sent to the State Prison at Michigan City, Ind. The nature of the problem is, in general, to ascertain what psychology and scientific study can do for these adult unfortunates, and then to apply the results to making them useful citizens. The inauguration of the laboratory was under favorable auspices, the Governor of the State and other officials being present and giving tacit sanction to the work. Professor Kleinsmid is a graduate of Northwestern University, and for several years has been the Professor of Psychology at DePauw University. For some time he has been giving much attention to Abnormal Psychology and its relation to Education. More recently he made a tour of the country studying, at first hand, the work of such men as Dr. Goddard. So far, this seems to be the first attempt to apply the principles of psychology, in this manner, to adult criminals in a State reformatory institution. Since beginning his active work Professor Kleinsmid has made individual studies and measurements of several hundred inmates. As yet it is too recent to give predictions or estimates of results of this interesting work.

The vacancy made at DePauw University by the leaving of Prof. R. B. von Kleinsmid has been filled by Arthur R. Mead, formerly Acting Assistant Professor of Education, University of Minnesota, who becomes Acting Professor of Education and Psychology at DePauw.

Prof. H. E. Jordan of the University of Virginia has been appointed lecturer on eugenics on the new lectureship recently established at that institution by Mrs. Huntington Wilson of Washington, D. C. Professor Jordan's topic was "Eugenics—Its Data, Scope, and Promise."

Prof. Henry Suzzallo of Teachers College, Columbia University, was the chief speaker before the California State Teachers' Association during the holidays. He delivered a series of lectures on sociological aspects of public education.

At the meeting of the American Psychological Association in Cleveland December 31-January 1 Prof. H. C. Warren of Princeton University was elected president for the ensuing year.

Dr. P. P. Claxton, United States Commissioner of Education, was elected vice-president of Section L—Education—of the American Association for the Advancement of Science, at Cleveland, and Mr. S. A. Courtis of Detroit, Mich., was chosen secretary.

Prof. George Trumbull Ladd, Vice-President of Section H—Anthropology and Psychology—of the American Association for the Advancement of Science, chose as the subject of his presidential address at Cleveland "The Study of Man."

The subject of Prof. Edward L. Thorndike's address as President of the American Psychological Association at Cleveland was "Ideomotor Action."

Mr. S. A. Courtis, head of the department of science and mathematics in the District Home and Day School, and author of the Courtis Standard Tests in Arithmetic, recently addressed the Harvard chapter of Phi Delta Kappa, an honor society in Education, on the subject of testing public school children. Mr. Courtis, as a member of the Hanus School Inquiry Commission, made extensive tests of the arithmetical abilities of school children in New York City, and has recently conducted similar tests on several thousand school children in Boston.

Prof. Walter B. Pillsbury, head of the department of psychology, University of Michigan, sailed for Italy shortly before the holiday recess. Professor Pillsbury had planned to go abroad about February 1, but ill-health hastened his departure.

W. S. Hunter, Ph.D. (Chicago), has been appointed instructor in psychology in the University of Texas.

F. A. C. Perrin, Ph.D. (Chicago), has been called to the University of Pittsburgh as instructor in psychology.

CURRENT PERIODICALS.

(In this section only such articles will be noticed as bear directly or indirectly upon the interests of this Journal.)

BRITISH JOURNAL OF PSYCHOLOGY. Vol. V, Part 3, November, 1912. HENRY RUTGERS MARSHALL. *The Relation of Instinct and Intelligence.* 247-266. The author claims that complex adaptive intelligent responses are statable in terms of instinct action. Both instinct feelings and intelligence experiences are the resultants of innate tendencies which must ultimately be referred to inherited structure developing under environmental conditions.

A. M. HOCART. *The Psychological Interpretation of Language.* 267-279. A study in the development of meanings, illustrated by examples from the languages of primitive peoples.

EDUCATION. Vol. XXXIII, No. 4, December, 1912. LOUIS W. RAPEER. *Outlines of Educational Hygiene, Emphasizing Medical Supervision.* 200-207. Medical inspection should be under the control of the Board of Education, and should be placed on an educational basis. Much attention should be given to the division of functions and duties between the school physician and the school nurse.

LAURA H. WILD. *Training for Social Efficiency—The Relation of Health to Efficiency.* 208-222. An interesting account of recent movements to secure more healthful conditions for pupils.

FRANK WEBSTER SMITH. *The Normal School Ideal.* 223-227. Discusses the practical, in contrast to the professional, objects of study in normal school work. Among these are health of pupils, stimulus of surroundings, conditions of school localities, personality of the teacher, common school studies, and the function of the practice school.

THE PEDAGOGICAL SEMINARY. Vol. XIX, No. 4. December, 1912.

ISSAC EMERY ASH. *The Correlates and Conditions of Mental Inertia.* 425-437. An objective measure of independence and originality of thought was sought by giving pupils five pairs of tests, each pair involving an alternative of original observation and study, or the performance of a set task. The results showed that initiative and independence in one situation are apt to manifest themselves in other situations also. Such "persistence of type" is more pronounced in boys than in girls.

ROXANA E. ANDERSON. *A Preliminary Study of the Reading Tastes of High-School Pupils.* 438-460. A questionnaire embracing fourteen topics was sent out and replies were secured from 588 Iowa high-school pupils. On the basis of the results the author discusses the high-school course of study in English, and suggests modifications of required readings.

KATHERINE E. DOLBEAR. *Precocious Children.* 461-491. A summary of recent studies of precocious children, and a consideration of historical geniuses. No first-hand observations are reported. There is a bibliography of sixty-three numbers.

CLARENCE LEONARD STAPLES. *A Critique of High-School Latin.* 492-509. Urges the importance of good textbooks, and recommends emphasis upon those aspects of Latin which are most prominent in the English language. Suggests a course in Applied Latin.

EDWARD HARLAN WEBSTER. *Verse-Making in Our Schools.* 510-517. Verse-making is natural for the child, stimulates to self-expression, contributes to fluency in English, and makes for a better appreciation of poetry.

EARL BARNES. *The Education of a Partially Paralyzed Muscle.* 518-521. Infantile paralysis destroys many of the nerve cells in the cord, but muscular functions can be largely restored by educating other groups of neurones.

THOMAS A. STOREY. *A Follow-up System of Medical Inspection.* 522-525. The results of a plan by which college students are induced to carry out the recommendations of the department of hygiene.

WM. H. BURNHAM AND M. EVELYN FITZSIMMONS. *The Educational Museum at Clark University.* 526-552. A valuable catalogue of the exhibits of this museum.

REVUE PSYCHOLOGIQUE. Vol. V, Nos. 2 and 3, June and September, 1912. AD. FERRIÈRE. *A Dynamic Theory of Heredity and the Problem of the Transmission of Acquired Characters.* 117-151. The author assumes a "cellular consciousness" which controls the relations of the cells within the organism. He thinks that the transmission of acquired characters is probable, in so far as these affect the cellular consciousness, and that the mechanism of the transmission is a sort of "vital induction," analogous to electrical induction in the world of inanimate objects.

VARIA KIPIANI. *Ambidexterity, an Experimental and Critical Study.* 151-248. A very elaborate and detailed study of the subject. A discussion of the theories and scientific basis of asymmetry is followed by a consideration of the pedagogical and pathological points of view, and the article concludes with an experimental study of ambidextral writing and drawing. There is a bibliography of seven pages.

I. IOTEYKO. *The Psychological Basis of Ambidexterity.* 249-253. Argues vigorously against the attempt to train left-handed children

to write, sew, etc., only with the right hand. Thinks that we go to dangerous extremes in the development of righthandedness.

N. BRAUNSHAUSEN. *The Fifth Congress of Experimental Psychology at Berlin.* 255-264. Believes that German experimental psychology stands at a parting of the ways, and that there is a strong tendency to turn away from the study of sensations, ideas, emotions and volitions as objects of pure science, and to bring the detailed and highly elaborated technique of the laboratories to bear upon the problems of applied psychology.

MARIE L. DELHAYE-LAWAESE AND L. GOYENS. *Report of the First Congress of French-speaking School Physicians.* 265-272. Gives a good idea of current problems in the medical inspection of French schools.

SCHOOL REVIEW. Vol. XX, No. 10, December, 1912. EDWARD O. SISSON. *College Students' Comments on Their Own High-School Training.* 649-664. It is admitted that the improvement of teaching lies in a more careful study of the pupils taught. From this point of view the critical evaluation by mature college students of the experiences of their high-school careers constitutes an important source of pedagogical psychology, and this article deserves the careful study of both psychologists and teachers.

EDWARD V. D. ROBINSON. *The Reorganization of the Grades and the High School.* 665-688. The course of mental development is continuous. It is generally conceded that the break between the elementary and the high school is out of harmony with the development of the child. The present article indicates a number of plans by which greater harmony might be secured.

PUBLICATIONS RECEIVED TO JANUARY 1, 1913.

(Notice in this section does not preclude a more extended review.)

A. A. Brill. *Psychoanalysis: Its Theories and Practical Application.* Philadelphia: W. B. Saunders Company, 1912. Pp. 337. $3 net.

Those who have read fragmentary accounts of the application of psychoanalysis to various phases of education will welcome this authoritative exposition of its principles and methods. Dr. Brill, who is a former pupil of Professor Freud's, and is now chief of the Neurological Department of the Bronx Hospital, is eminently fitted for the task of interpreting Freud's views to English readers. Whatever may be thought as to Freud's theory of the subconscious and the dominance of suppressed sexual elements in dreams and psychoses, the skill of the psychoanallist in laying bare desires of which the patient himself was unaware is at times almost uncanny. While it may be conceded that the Freud school lays an emphasis upon sex which seems disproportionate, it is undoubtedly true that the educator and the physician should take more careful account of the thought undercurrents which determine so many of our actions. This book will contribute largely to that end.

Otto Bobertag. *Quelques réflexions méthodologiques a propos de "l'echelle métrique de l'intelligence" de Binet et Simon.* Reprinted from L'Année Psychologique 18: 1912. Pp. 271-287.

An examination of some of the criticisms made upon the Binet scale in which the general method of procedure is defended, but the question is raised as to the amount of difference in response that will justify ranking a test as belonging to one age or another.

Otto Bobertag. *Ueber Intelligenzprüfungen (nach der Methode von Binet und Simon).* Reprinted from Zeitschrift für angewandte Psychologie, 6: 1912. Pp. 495-535.

The author reviews the total results presented in his former paper (See this Journal, Vol. III, p. 101) and enters into an elaborate mathematical discussion of the percentages attained by the pupils of each age. The criterium of "passing" adopted by each one who has used the Binet scale is critically examined, and a subsequent test is described which involved the retesting of many of the children examined before. The paper deserves careful study.

W. E. CASTLE, J. M. COULTER, C. B. DAVENPORT, AND OTHERS. *Heredity and Eugenics.* Chicago: The University of Chicago Press, 1912. Pp. vii, 315. $3 net.

This book is intended to present the recent developments of knowledge in reference to evolution, heredity, eugenics, and related subjects. Five of the leading investigators in this field have collaborated in its production, and the result is a work which will appeal to the general public, because it presents the latest conclusions in a popular and extremely interesting manner. Each contributor has borne in mind that he is addressing readers untrained in biology, and all technicalities have been avoided wherever possible. The book represents that high type of popularization of biological science which is so much to be desired, and of which we have had so little since the days of Huxley.

W. W. CHARTERS. *Methods of Teaching.* Revised edition. Chicago: Row, Peterson & Co., 1912. Pp. 444.

A revision of Charter's very successful book, first published in 1909. The style has been greatly improved, and the general treatment lightened and enlightened by the addition of numerous and well selected concrete illustrations. The general organization and the statement of fundamental theory remain much as in the older edition. The "practical" chapters have been expanded and enlarged.

HENRY H. GODDARD. *The Form Board as a Measure of Intellectual Development in Children.* Reprinted from The Training School, 9: June, 1912. Pp. 4.

A description of the form board, an account of the typical behavior of children in the test, and tables of the test time for normals and defectives, arranged according to mental and chronological ages.

HENRY H. GODDARD. *The Height and Weight of Feeble-minded Children in American Institutions.* Reprinted from the Journal of Nervous and Mental Diseases, 39: No. 4, April, 1912. Pp. 217-235.

"The low-grade idiot has not only a disturbed brain function, but his entire organism is disarranged and growth processes upset. In the imbecile the same is true, but to a less extent. In the moron we have practically normal growth during the immature years, but an arrest of growth earlier than in normals."

HENRY H. GODDARD. *The Responsibility of Children in the Juvenile Court.* Reprinted from the Journal of the American Institute of Criminal Law and Criminology, 3: No. 3, September, 1912. Pp. 13.

At least twenty-five per cent. of the children that come before our juvenile courts are feeble-minded. It signifies absolutely nothing to put these children on probation or send them to reformatories. They are unable to take care of themselves, and should, therefore, be cared for by society.

WILLIAM ERNEST HOCKING. *The Meaning of God in Human Experience.* New Haven: Yale University Press, 1912. Pp. xxxiv, 586. $3 net.

This is perhaps the most important book on the religious consciousness that has appeared since William James' *Varieties of Religious Experience.* Every thoughtful person will recognize that whether or no God has created man, every man creates his own God. And some form of God every thinking being has created, whether he calls it Father, or Absolute, or Ideal, or Nature, or Science, or Self. The consideration and classification of these "Gods many and Lords many" as they have appeared in human experience is the aim of this book. The titles of the different parts are: Part I, Religion as seen in its effects; Part II, Religious feeling and religious theory; Part III, The need of God; Part IV, How men know God; Part V, Worship and the mystics; Part VI, The fruits of religion.

L'Intermediaire des Educateurs. Vol. I, No. 1, October, 1912. Published by L'Ecole des Sciences de l'Education (Institute J.-J. Rousseau). Geneva, Switzerland: Pierre Bovet, 5 Place de la Taconnerie. Pp. 16. Subscription price for ten numbers, Fr. 3.50.

This little magazine, as its title indicates, proposes to act as the "go between" for those who have questions to ask and those who have answers to offer. Special stress is to be laid upon experimental problems in education.

ROBERT JAMES KELLOGG. *Studies in Linguistic Psychology.* 1: No. 2, June, 1912. Published by the James Millikin University, Decatur, Ill. $1.25 per volume of four numbers, or 40 cents per number.

A casual inspection of this little brochure leads one to believe that the author is well read on both the psychological and the linguistic phases of his understanding and that he is earnestly endeavoring to

develop a genetic conception of language. His earnestness is attested by the profusion of black-letter scattered somewhat promiscuously over his pages, and his endeavor is marked by the coinage of such words as psycation and mentition.

F. KUHLMANN. *A Revision of the Binet-Simon System for Measuring the Intelligence of Children.* Journal of Psycho-Asthenics Monograph Supplements, Vol. I, No. 1. Faribault, Minn.: Published by Minnesota School for Feeble-Minded, 1912.

The author has incorporated many of the changes suggested by Goddard and by Terman and Childs. His own revisions involve (1) the standardization of procedure; (2) the shifting of certain tests to age-groups for which they are better adapted; (3) the elimination of poor tests; (4) the reduction of the number of tests for each age-group to five, and (5) the extension of the tests downward to include the following age-groups: two years, one year, six months, and three months. The tests have been admirably arranged for convenient application.

J. RAMSEY MACDONALD. *Syndicalism: A Critical Examination.* Chicago: Open Court Publishing Co., 1912. Pp. viii, 74.

Syndicalism is a labor movement that differs from trades-unionism and socialism in that it proposes indirect as opposed to direct action. Labor is to be emancipated, not through a general absorption of the industries by the government, nor by the organization of workmen for the purpose of influencing legislation, but rather by the formation of industrial combinations among the workers themselves. They must control the industries. The most prominent advocate of this movement, which seems to be gaining ground in Europe, is a French philosopher-poet (erstwhile engineer), Georges Sorel. The present volume is a brief and fascinatingly written account of this unique labor program.

A. J. WILLIAM MYERS. *The Old Testament in the Sunday-School.* New York: Published by Teachers College, 1912. Pp. viii, 141.

"The primary purpose of this essay is to examine the adaptability of the Old Testament as material for the Sunday-school curriculum according to the principle (1) of education, (2) of biblical criticism, and (3) of the Christian conception of life and of society." Modern educational and religious presuppositions are tersely stated in the first chapter. Problems growing out of the history of Israel's religion and literature are discussed in Chapters II and III, and some results of ignoring these problems (for example, the inadequacies of the International Lessons) form the theme of Chapter IV. The remaining chapters are chiefly devoted to the working out of a graded

curriculum. An excellent bibliography concludes the volume. Unfortunately, an index is lacking—a fault in many of the Teachers College publications, which, although largely monographic in nature, are usually comprehensive enough to warrant indexing.

Proceedings of the Northern Illinois Teachers' Association. Aurora meeting, November 1 and 2, 1912. Pp. 23.

Introduction by C. A. McMurray. General topic: Relation of Educational Theory to Practice. Brief articles and statements of theses by W. H. Hatch, W. C. Bagley, H. A. Peterson and John W. Cook.

J. E. Wallace Wallin. *Aspects of Infant and Child Orthogenesis.* Reprinted from the Psychological Clinic 6: November 15, 1912. Pp. 153-173.

The paper contains an interesting program for "follow-up" work in connection with school hygiene and the medical inspection of schools.

J. E. Wallace Wallin. *Eight Months of Psycho-Clinical Research at the New Jersey State Village for Epileptics, with Some Results from the Binet-Simon Testing.* Reprinted from the Zeitschrift "Epilepsia," 3: 1912. Pp. 366-380.

Presents an interesting comparison of the mental age curves of epileptics and feeble-minded. The epileptics show a much lower percentage of idiots and imbeciles, but a much higher percentage of morons.

J. E. Wallace Wallin. *Experimental Studies of Mental Defectives. A Critique of the Binet-Simon Tests and a Contribution to the Psychology of Epilepsy.* Educational Psychology Monographs, No. 7. Baltimore: Warwick & York, Inc., 1912. Pp. vi, 155. $1.25.

This is one of the most important and extended studies of the Binet tests that have appeared in English. The first chapter treats of the Binet Scale as a diagnostic instrument for the classification of mental defectives. Chapter two is entitled "Testing the Binet Tests," and in view of the wide application that is being made of these tests is perhaps one of the most interesting parts of the monograph. In spite of many acknowledged defects, the author believes we should hold to the 1908 form of the scale until it has had a more extensive "try-out." In chapter three there is a valuable discussion of the variation of mental and physical traits in relation to the age classification of the Binet Scale, and the final chapter presents detailed directions for the application of the tests to children.

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THE JOURNAL OF EDUCATIONAL PSYCHOLOGY

THE PROBLEM OF FORMAL GRAMMAR IN ELEMENTARY EDUCATION.

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On every hand there is evidence of a widely growing distrust of the effectiveness of the present educational systems in this country. More and more the magazines, newspapers, citizens' clubs, research bureaus and other organs of public opinion are concerned with the question, Is education hitting the mark? The answer to this pertinent inquiry of the layman the educator himself cannot give, because he, too, does not know. He can utter platitudes and opinions, but these do not satisfy him and much less the present age. What he desires above all things at the present time is ability, methods, and opportunity for *measuring results.* Such evaluation of the various phases of modern school procedure in the light of some intelligible and satisfactory aim (social efficiency, or Dewey's "essentials of character:" social insight, social responsiveness, and social power) is a primary purpose of a rapidly growing number of men and women devoted to the progress of democracy and education.

The problem of this study is the verification of an investigation by Franklyn S. Hoyt of the functioning of formal grammar in the lives of elementary school children. Mr. Hoyt[1]

[1]See the *Teachers College Record* for November, 1906, "The Place of Grammar in the Elementary School Curriculum."

chose this subject for scientific testing because its place and value in the elementary school curriculum has long been disputed. He did not attempt to decide the question by references to authorities on the science of grammar nor by quotations from noted men as to how much they believed themselves to have been helped by the study of grammar as a separate subject in their youth. He attempted to measure results directly in the children of the public schools, and it is this which makes his study of permanent importance. The need of verification of such investigations requires no discussion here. Huxley long ago expressed the modern point of view in his statement that "the man of science has learned to believe in justification, not by faith, but by verification."

Mr. Hoyt subjected to criticism and to test the five leading arguments for teaching grammar as a separate subject in the elementary schools, namely, that the subject as taught:

a. Disciplines the mind;
b. Prepares the way for the study of other languages;
c. Gives command of an indispensable terminology;
d. Enables one to use better English;
e. Aids in the interpretation of literature.

He dismisses the formal discipline argument because, first, modern research shows that while the spread of training is not entirely mythical, still it is not sufficient to hold a subject in a modern curriculum; second, that grammar as ordinarily taught in the elementary school is abstract, relatively meaningless and beyond the needs and reasoning abilities of children; and, third, that it tends to retard rather than promote the natural development of the child, taking up his time and standing in the way of his progress toward a fair use of English in the few years of his school life; granted, of course, that with exceptional teachers or with exceptional children it may be made "to subserve a vital part in the educational process."

While the "Dogma of Formal Discipline" is, practically, still potent in common thought, and has only been "scotched, not killed," by the experimental psychologist, all will probably agree that it alone does not afford sufficient support to a course in the elementary school.

Abandoning, then, this theoretical argument as unsafe for justifying the subject, the author disposes of the second hypothesis commonly given, namely, that it prepares for the study of other languages, by showing, first, that in the best of cities most children do not enter high schools where other languages are taught, and that the places where they are taught below the high school are very few; second, that English is essentially "a grammarless tongue" so unlike the highly inflected Greek, Latin, German and French languages that its grammar can give little help; and third, that pupils who do enter the high school carry with them, even after two or three years' study of grammar, only a hazy, incomplete knowledge of the subject, insufficient to be of much help for any language.

Here, again, Mr. Hoyt's arguments seem to be sound and based upon well-known facts. The many studies of attendance, retardation, elimination, and the like, which have been made since 1906 seem to bear out his conclusions. We can, at least, tentatively grant so much.

Having disposed of the preparation-for-high-school-work basis for justification, the author likewise refuses to accept the sufficiency of the argument that formal grammar is necessary in the elementary school because it equips the pupil with certain indispensable grammatical terms. He asserts that the indispensable part of the terminology of grammar is limited to a very few terms, much better acquired by actual use in a functional way.

What the author here means may, perhaps, be illustrated by the language work in the Francis Parker School, Chicago, which the writer visited for several days in 1907. No period for grammar was shown on the program for the eighth grade. The teacher of this grade was asked if she taught the pupils grammar, and she replied, "Only as I find it helpful in writing or speaking English. If the pupil misuses adverbs, for example, I may call attention to this type of mistake and use the term, adverb. The pupil generally desires to know at this point what an adverb is, and I tell him." How few of such terms pupils really need should in some such manner be determined. It is not entirely a question of whether grammar when looked at alone may not be of some little value, but a question

of what knowledge is of most worth to the actual boys and girls in the actual public schools and with their actual careers in the actual world today immediately before them.

Whether the arguments thus passed over should also be subjected to experimental proof need not detain us. It is the strength of the two remaining props which concerns us here. Does the study of formal grammar in the elementary school help children very much (d) in the use of correct English and (e) in the interpretation of the language? These are the problems of the Indianapolis investigation and the Minneapolis verification.

The Investigation.

The reasoning of the Hoyt inquiry is substantially as follows: If the study of formal grammar helps pupils to *use* correct English, for example, then, in general, pupils having a good knowledge of grammar should be found to excel in the correct use of the language, and *vice versa*. That is, with careful tests and large numbers of children there should be found some significant degree of correlation between the two sets of ratings. This is all the more certain when we remember that strong students are frequently strong in several subjects and weak pupils are frequently poor in several subjects. How large the latter correlation is in general we do not at present know. Perhaps much of the small correlation found by both investigations can be accounted for on this basis. At any rate, the method of thinking is the same as that involved in finding the relationships between any two large groups of phenomena. If we wish to know, for instance, if there is any relationship, probably causal, between children's absence from school (through sickness or other causes) and their failure of promotion, we can determine it by seeing how generally *absence* is correlated with *failure* and whether the number of cases of the latter increases with the former. If, in general, *all* children who miss school over five weeks in a term fail of promotion, we should have a correlation of 100 per cent., or 1. A correlation of 50 per cent., or .5, would show a fair connection between the two phenomena, while one as low as 10 per cent., or .1, would be relatively insignificant in this case. In each

case it is necessary to take large numbers of children in various schools in order to eliminate as far as possible other causal factors.

Mr. Hoyt carefully prepared three examinations, one in grammar, one in composition, and one in interpretation, which were given to two hundred Indianapolis high school pupils who had but a few months before completed the work of the elementary schools.[2] The papers were carefully graded by two expert markers and correlations made according to the Pearson formula, with the following results:

	A's marks.	B's marks.	A's and B's combined.	Average of A's and B's correlation.	Probable true correlation.
Grammar and composition.....	.12	.23	.23	.18	.30
Grammar and interpretation.....	.22	.19	.28	.21	.35
Interpretation and composition....	.27	.30	.32	.28	.41

These rather generously estimated "probable true correlations" the author asserts are "not sufficiently great to lead us to believe that knowledge of, or proficiency in, one of them depends upon, or is materially influenced by, a similar attainment in either of the other abilities," thus vindicating to some extent, also, the stand made with reference to the disciplinary value of grammar.

More light is thrown upon these low correlations when we compare them with correlations made between the ratings for different subjects in college entrance examinations and elsewhere, as given in Thorndike's "Educational Psychology" (1902 edition) and Mr. Hoyt's thesis. Higher correlations are found between totally different subjects than between grammar and these two abilities. A student with a given grade in grammar is more likely to have a similar grade in history, for example, than he is to have a similar grade in composition or interpretation. Where possible, future tests of these relationships may well take in correlations between grammar and the students' actual ratings on examination in other subjects. These were not undertaken in this investigation nor in the verification.

[2]For directions and examinations see appendix of this article.

The Verification.

It has been necessary to give much space to the original Hoyt investigation in order to show what has been tested. The careful investigator today publishes not only the results of his inquiry, but gives also the methods he has used and his original data so far as possible. The later student of the problem may recompute the original investigation from the data or he may follow the same method to see if the same results are obtained. The writer has verified the computations, but he could not easily obtain the original examination papers, and the latter precaution is probably not necessary. No other conclusions seem to be derivable from the figures given, although the data may be used, of course, for various purposes. The method of verification was to follow carefully the exact method used by Mr. Hoyt, taking only a different group of children. The pupils he tested were beginning high school pupils in Indianapolis; those tested for the verification were beginning high school pupils of Minneapolis.[3]

It was not thought necessary to have the papers marked by two persons, working independently, in the case of the verification. Independent marks were made of twenty papers in each subject, and these corresponded so closely to the marks already given by the investigator that the second marking was abandoned. The expense and labor seemed too great for the extra accuracy. No marks were put on the papers; they were kept on separate sheets for each subject and all the papers for a single subject were graded at a time. The names were unfamiliar to the writer and no attention was paid to the general correspondence of the marks for any pupil in the various subjects.

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[3]The second tests were given in the East and Central high schools of Minneapolis through the kindness of Principals W. F. Webster and John Greer, respectively, on the same day, in the month of February, 1907. The pupils were from 40 different elementary schools and showed good, average knowledge of the subjects in which they were tested. They had entered the high schools in the middle of the school year, about January 20.

The results, as given below, are a surprising proof of the accuracy of Mr. Hoyt's correlations:

Correlation of grammar and composition.....	.23.	Probable true C. not over .3
Correlation of grammar and interpretation....	.10.	Probable true C. not over .2
Correlation of composition and interpretation..	.24.	Probable true C. not over .3

They show that there is very little connection between the results by subjects of these examinations of these pupils, with the probability that there is little connection between *all* that is gained from any two of these subjects as now taught and for children in general of the same grade. Other tests and other methods should be used to carry the matter to relative finality.

For those who wish further to verify the conclusions there are given in the appendix, also, the marks which the pupils received in each subject. They are given as deviations from the stated medians in order to save labor for any who wish to use them. The actual marks can easily be obtained by adding the deviation to the median for the subject.

Conclusions.

These two tests and the careful consideration of the other values thought to exist in the teaching of formal grammar to elementary pupils seem to take away much of the support the subject now has. A fact remarkable to the writer has been the readiness with which schoolmen generally endorse the conclusion that formal grammar is of little value to elementary pupils, while the subject nevertheless remains relatively unchanged, often beginning in the fourth or fifth grades of the elementary curriculum. With the great demand made on the elementary school in our present-day, changing, industrial democracy, it is no longer admissible for a subject to remain in the curriculum for no other reason than tradition and inertia. With the whole range of vocational, hygienic, and socializing training needed by our "nation of sixth graders," and with the curriculum now overcrowded, we need an immediate further evaluation of this subject and a speedy adjustment to the conclusion.

We need to relieve ourselves of the stigma put upon us by Professor Beard (true also for the university in which he works, of course) that American educators have great courage

in adding new subjects to the curriculum, but very little in modifying or eliminating the old ones. We cannot depend upon reports of committees of five or fifty to settle such matters. The only sure avenue will be through the laborious testing of results.

Some relatively gratuitous suggestions might be:

a. Postpone formal grammar instruction until, at least, the eighth year, devoting the time now given to it in lower grades to careful use of English in *all* work and in special language lessons.

b. Use only such grammatical terms and study of the science of grammar as seem, or are proved, to be actually necessary. Select carefully these terms and principles and standardize them. All the pupils in a school system or in the country may well use the same names for the same things in this field. (Steps are being taken in this direction.) With such use and selection all the principles may be given in an organized review covering probably not more than the last half of the eighth year. Many children will, of course, never reach this grade, but they *may* be able to write their letters and speak with fair correctness when they go out into the larger life, and this is essential.

c. The functional use of language in as nearly as possible real life situations, drills in correct speech, and "never-failing watch and care" over the ordinary language of the classroom and playground should take the place of most of the large amount of time[4] now given to this subject in our elementary schools. There are many subjects which to the adult appear finely adapted and quite necessary for the children's education. Of the many proposed we must select only those which actually are of the greatest value and which the child can assimilate and use in the short average time of his school days.

[4]See Payne's "Public Elementary School Curricula."

d. School text-books in language, so necessary for most American teachers, should be selected with the greatest care. Many now attempt the functional method of teaching grammar and correlate it closely with language work. In order to get a wide sale for the books, however, all the grammar that any schoolman might demand is crowded in, so careful selection and elimination is necessary even in the best texts. For the experienced and able teacher the life situations of her class will prove more useful as guidance material for language work than any text, valuable as the latter sometimes is.

Appendix I.

Directions for Giving Tests.

"The object in giving these tests is to determine what relation a knowledge of grammar bears to the ability to use good English and to interpret language.

"First, give a test in composition, allowing the pupils to write for forty minutes on this subject (which should be written on the board without development): 'How would you spend a thousand dollars if that sum should be given you to spend during the Christmas holidays? Why would you spend the money as you propose rather than in any other way?' Pupils should write the name, address, name of school, etc., at the head of the composition, as asked for in the test in grammar.

The tests in grammar and in power of interpretation should follow as soon after the test in composition as convenient. These two tests should be given on successive days, in the order given: *i. e.*, the test in interpretation following the test in grammar.

Arrange the papers for each test in order of merit, the best on top.

Test in Grammar.

State these facts at the top of the first sheet of paper:

1. Date of test.
2. Your name.
3. Your address.

4. Name of your school.
5. Your age (at last birthday).
6. Date of birthday.
7. Grammar school last attended.
8. How many years did you attend there?
9. Have you ever studied the poem quoted below, Gray's "Elegy Written in a Country Churchyard?" If so, to what extent?

(Answer as many of the following questions as you can in 40 minutes. The questions are all based on the following stanzas from Gray's "Elegy Written in a Country Churchyard:")

1. The curfew tolls the knell of parting day,
   The lowing herd winds slowly o'er the lea,
   The plowman homeward plods his weary way,
   And leaves the world to darkness and to me.

2. Now fades the glimmering landscape on the sight,
   And all the air a solemn stillness holds,
   Save where the beetle wheels his droning flight,
   And drowsy tinklings lull the distant folds;

3. Save that, from yonder ivy-mantled tower,
   The moping owl does to the moon complain
   Of such as, wandering near her secret bower,
   Molest her ancient solitary reign.

4. Beneath those rugged elms, that yew tree's shade,
   Where heaves the turf in many a mouldering heap,
   Each in his narrow cell forever laid,
   The rude forefathers of the hamlet sleep.

1. Select and write out in full (a) a compound sentence; (b) a complex sentence.
2. Diagram or analyze the last two lines in the first stanza.
3. Select (a) two phrases and (b) two clauses. Tell what each modifies.
4. Give the part of speech of the first word of each stanza, and tell why you so classify it.
5. What is the case of each of the nouns in the last stanza? What determines the case in each instance?
6. Give the voice, mode, tense and number of the verbs in stanza 3; also tell whether they are transitive or intransitive, and why.
7. Name the adjectives in stanza 3, and tell what the use of each is in the sentence.
8. Give the simple subject, the simple predicate, the complete subject and the complete predicate of the sentence in stanza 4.
9. What part of speech is each of the following words? Give your reason for so classifying it:

   First stanza: *o'er, homeward.*
   Fourth stanza: *those, many.*

10. Select four verb-forms that are not used as simple predicates. As what part of speech is each used?

Test in Interpretation.

Time, 50 minutes.

1. Express in prose the thought of the stanzas given below. Use the language of the poem as far as possible, making, however, such changes as may be necessary to render the thought in clear, straightforward prose. Unusual words may be looked up in the dictionary.

These stanzas are taken from Gray's "Elegy Written in a Country Churchyard." It will be recalled that the part of the poem preceding these stanzas contains a description of the churchyard and of the character of the "rude forefathers of the hamlet" buried there. In the stanzas given the poet continues to refer to these buried forefathers:

Perhaps, in this neglected spot is laid
Some heart once pregnant with celestial fire;
Hands that the rod of empire might have swayed,
Or waked to ecstasy the living lyre.

But Knowledge to their eyes her ample page,
Rich with the spoils of time, did ne'er unroll;
Chill Penury repressed their noble rage,
And froze the genial current of the soul.

Th' applause of list'ning senates to command,
The threats of pain and ruin to despise,
To scatter plenty o'er a smiling land,
And read their history in a nation's eyes,

Their lot forbade; nor circumscribed alone
Their growing virtues, but their crimes confined;
Forbade to wade through slaughter to a throne,
And shut the gates of mercy on mankind.

2. Give the thought of these four stanzas briefly in your own words.

Appendix II.

Individual Records Given as Deviations from Type.

In the following table is given the individual marks of the pupils expressed, for convenience in verification,[5] as deviations from the medians 77, 23 and 19, respectively. In order to avoid fractions all records in composition and interpretation were doubled, the actual medians for composition and interpretation having been 11.5 and 9.5. The marking was done in the same way as in the Indianapolis tests. "Each answer in the grammar test was marked on a scale of ten. The sum of these marks gave the 'quantity mark' for the paper. The mode or the average[6] was taken as the 'quality mark.' The total

[5] Original marks can easily be obtained from these if desired, as above noted.
[6] The average was taken when it was near the mode, or was typical; otherwise the mode was used.

mark for the paper was obtained by the use of the following formula: (Quality mark × 5) + Quantity mark." This accounts for the marks above one hundred in grammar.

"The composition and interpretation papers were marked on the scale of twenty, an average paper receiving the mark of ten."

Individual.	Grammar.	Composition.	Interpretation.
1	26	9	1
2	30	13	— 1
3	—12	— 3	—18
4	9	3	—11
5	26	— 1	— 1
6	3	1	15
7	4	13	17
8	13	1	1
9	43	3	1
10	—17	1	3
11	15	3	— 1
12	25	5	— 3
13	— 4	— 5	— 1
14	32	— 3	— 9
15	31	5	1
16	1	— 3	— 1
17	— 7	5	— 5
18	— 1	— 1	—15
19	15	1	— 3
20	20	3	5
1	—13	— 7	— 3
2	8	1	— 9
3	—19	—18	5
4	—30	1	— 7
5	18	3	— 3
6	0	— 6	— 1
7	—22	— 1	1
8	—14	1	— 5
9	11	3	—15
30	37	1	5
1	37	— 1	7
2	— 3	3	5
3	11	3	—11
4	9	2	— 8
5	—32	— 5	3
6	— 6	15	1
7	2	5	15
8	23	1	1
9	—52	11	1
40	—14	9	—11
1	—10	11	3
2	15	— 7	1
3	15	1	— 7
4	— 9	— 7	1
5	— 6	1	— 5
6	—13	3	3
7	30	— 3	— 7
8	— 9	— 1	— 1
9	—32	— 7	— 7
50	—31	— 5	— 9

Individual.	Grammar.	Composition.	Interpretation.
51	—35	— 9	— 7
2	25	5	1
3	— 9	— 4	— 1
4	—22	— 1	4
5	— 4	3	4
6	— 7	— 5	— 1
7	29	— 9	5
8	13	3	1
9	0	— 1	9
60	6	3	3
1	— 6	— 6	1
2	32	9	1
3	—37	3	— 5
4	— 6	— 1	—17
5	—25	— 3	— 7
6	— 4	— 3	—15
7	12	—11	— 9
8	5	—19	1
9	7	— 3	1
70	— 4	5	3
1	—16	— 7	1
2	— 1	1	— 3
3	22	— 9	— 5
4	—15	7	— 1
5	— 9	— 1	— 3
6	— 9	— 3	2
7	7	15	— 1
8	—12	5	1
9	6	—11	— 3
80	—24	— 3	— 3
1	9	—13	— 9
2	9	1	—15
3	2	7	1
4	— 5	—17	1
5	2	3	1
6	2	— 1	1
7	— 7	— 4	— 3
8	10	3	— 1
9	31	1	3
90	— 7	—11	— 7
1	20	1	9
2	22	— 4	— 5
3	24	5	— 1
4	42	5	1
5	3	3	1
6	—37	1	— 1
7	11	3	5
8	—16	5	9
9	— 8	3	11
100	—13	3	5

Individual.	Grammar.	Composition.	Interpretation.
101	37	7	— 3
2	—16	—17	— 7
3	—22	3	— 1
4	2	3	— 7
5	— 5	— 3	— 9
6	—15	— 5	—17
7	—12	1	13
8	1	3	— 5
9	0	3	— 3
110	1	— 3	3
11	13	3	11
12	13	5	—13
13	22	— 5	— 3
14	—15	3	13
15	—25	— 1	—17
16	— 7	—11	—15
17	25	— 3	—13
18	53	5	—11
19	— 5	— 7	7
120	22	1	4
1	29	— 5	— 3
2	17	3	— 9
3	2	— 3	— 1
4	71	13	21
5	34	5	1
6	13	1	— 9
7	15	— 1	—13
8	—15	3	— 7
9	— 6	5	— 5
130	13	— 7	—17
1	— 8	— 3	—15
2	— 1	1	17
3	— 1	— 7	—15
4	6	— 1	— 9
5	20	— 3	1
6	11	1	— 7
7	11	3	7
8	5	5	1
9	13	— 1	— 7
140	1	5	— 3
1	— 4	3	— 5
2	— 8	1	— 9
3	29	— 9	— 7
4	5	— 3	3
5	3	1	— 7
6	— 4	— 1	— 9
7	—25	—17	— 9
8	9	3	5
9	— 8	5	— 7
150	12	— 1	— 5
151	— 2	5	—11
2	—12	3	1
3	—12	5	17
4	— 6	1	— 3
5	13	3	1
6	11	13	19
7	1	3	9
8	1	— 3	11
9	3	— 3	— 1
160	13	3	— 9
1	13	— 1	— 5
2	— 3	1	5
3	13	1	— 3
4	2	— 7	9
5	—11	— 1	— 7
6	12	3	1
7	— 9	— 3	3
8	21	— 7	1
9	—12	—13	— 9
170	— 4	— 1	1
1	— 7	3	—11
2	3	— 3	17
3	— 4	3	15
4	— 7	3	7
5	—12	5	— 3
6	—13	—15	1
7	— 7	1	3
8	4	— 1	1
9	31	— 3	— 3
180	1	— 3	— 7
1	0	— 9	— 7
2	15	— 1	— 9
3	— 5	1	7
4	3	— 5	1
5	12	— 5	5
6	2	1	— 1
7	2	1	1
8	— 6	—11	9
9	3	—15	1
190	12	— 1	13
1	— 8	— 3	1
2	6	— 1	— 3
3	—11	—13	3
4	—20	7	— 3
5	—11	— 3	— 5
6	3	— 5	— 7
7	—14	1	17
8	— 7	— 1	1
9	21	1	11
200	5	5	5

THE SLEEP OF SCHOOL CHILDREN: ITS DISTRIBUTION ACCORDING TO AGE, AND ITS RELATION TO PHYSICAL AND MENTAL EFFICIENCY.[1]

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Part I. The Distribution of Sleep According to Age.

Among the important questions which may be raised regarding the sleep of school children are the following: What is the optimum amount of sleep for physical and mental efficiency, and how are we affected by variations above or below this amount? How great are the normal individual differences? To what extent is the instinct of sleep educable? How is it influenced by food habits, by rise and fall of barometric pressure, or by changes in humidity and other weather conditions? How is it affected in quantity and quality by ventilation, by light, by the presence of others in the same bed or rooms, etc.? How is it influenced by various evening occupations? How much and what kind of home study can be assigned by the school without a detrimental effect upon sleep?

One of the most important problems and the one which has caused the most speculation concerns the optimum amount of sleep for children at different periods of growth. In all of the discussions concerning school overpressure, care of infants, etc., authors have very generally laid great emphasis upon the necessity of a large amount of sleep for the developing organism. But exactly how much sleep *is* required by this developing organism for its healthy functioning and growth? We have a large number of *estimates based upon opinion and loose observation,* but no answer based on data of scientific validity.

[1]This study will appear in three parts. The bibliography references will be found at the end of Part III.

The most quoted of these estimates is that of Dr. Clement Dukes, whose theoretical norms have been very generally accepted. Other notable standards are those of Hertel, Bernhard and Claparède. Physicians and writers on school hygiene agree in insisting that children are likely to receive less sleep than is needful to them, but disagree as to the exact amount which is needful. This difference of opinion is well shown in the following table of estimates by various authors:

TABLE I.—ESTIMATES OF SLEEP NEEDS IN HOURS.

Age.....	5 to 6	7	8	9	10	11	12	13	14	15	16	17	18
Duke	13½	13	12½	12	11½	11	10½	10	10	9½	9	9	8½
Bernhard	..	11	11	11	10½	10½	10	10	9½	..	..	..	..
Hertel	11	10½	10½	10	10	9¾	9½	9½	9	9	8¾	..	..
Claparède	11½	11½	11½	10½	10½	9½	9½	9½	9	9	..	..	..
Manaceine	14	11	11	11	10	10	9½	8½	8½	8	8 to 7	..	..
Krollich	..	11	11	11	10½	10½	10	10	9½	9	9	8½	8½
Cavanagh	..	12	..	..	..	..	..	..	..	..	..	..	9
Brown	11½	..	..	..	..	..	10	..	..	..	..	..	..
Pfaunder	11	..	..	..	..	..	9	..	..	..	..	..	..
Key	11	..	..	..	..	..	10	..	..	..	..	..	..

The above table shows a difference of opinion amounting to 2½ hours for the age six, 2½ hours for seven years, 2 hours for eight years, 2 hours for nine years, etc. Duke recommends as many hours for age eighteen as Manaceïne for age thirteen, and as many hours for age fourteen as Manaceïne for age ten. Duke's estimate for eleven years also equals Key's for six years. In like manner twenty-nine medical officers of English schools who were interrogated by Acland (1)* estimated the sleep needs of twelve-year-old boys all the way from nine hours to ten or more.

Such extreme differences of opinion on this important subject emphasize the desirability of empirically ascertained standards of sleep for the various ages of childhood.

Several investigations have been made of the number of hours children do sleep, though obviously we cannot in this way determine conclusively how many hours they ought to sleep. One of the earliest of these was by Hertel, who, in his study "*Overpressure in the Schools of Denmark*," presents sleep records from 3141 boys and 1211 girls in the schools of

*Numbers in parentheses throughout the text refer to bibliographical references which will follow at the end of part III.

Copenhagen. These averaged about 10½ to 11 hours of sleep at six years, the amount decreasing to 9½ hours at twelve years and to about 8½ at sixteen years. Sleep was most deficient among pupils pursuing the arduous classical courses, where it often fell to 6 or 7 hours.

The following table compiled by Acland shows the hours of "undisturbed rest" given to boys of 10 to 13 years of age in forty English public boarding schools. The actual time of sleep must be somewhat below these figures, and is certainly far below what physicians have usually considered the optimum:

TABLE II.—HOURS OF REST IN ENGLISH BOARDING SCHOOLS.

Class.	No. of Schools.	Ample Hours.	Moderate Hours.	Short Hours.
A.	5	9¾ to 10 or more all the year.	9 during the summer term.	
B.	2	9½ to 10 the two winter terms.		
C.	7	9½ to 10 for a few weeks only.	9 to 9½ the chief part of the year.	
D.	3		9 to 9¼ all the year.	
E.	7		9 to 9½ the two winter terms.	8 to 8½ during the summer term.
F.	8		9 to 9½ for a few weeks only.	8 to 8½ the chief part of the year.
G.	8			8 to 8¾ or less all the year.

The most extensive investigations of the sleep of school children are those of Dr. L. Bernhard (5) and Dr. Alice Ravenhill (31). Bernhard secured data from 6551 German children six to fourteen years of age; Ravenhill from 6180 English children of corresponding ages. The average amount of sleep for each year is shown in the following table:

TABLE III.—SLEEP OF GERMAN AND ENGLISH CHILDREN.

Age		6	7	8	9	10	11	12	13	
Sleep in hours and minutes.	Bernhard	10.20	9.50	9.25	9.20	9.10	8.55	8.25	7.50	
	Ravenhill	10.30	10.30	9.30	9.15	9.15	8.45	8.15	8.30	Boys
		10.45	10.30	10.15	9.30	9.30	9.15	8.	7.30	Girls

Using his own estimate of the amount of sleep which children ought to have, Bernhard computes that the sleep deficiency among his 6551 pupils ranges from about an hour at the age of seven to nearly an hour and three-quarters at fourteen years. This would represent a total sleep loss per year of over 400 hours for the average child of six, and over 600 hours for the average child of fourteen years. Basing her estimate upon the standards furnished by Dr. Dukes, Miss Ravenhill finds an average sleep deficiency for English children of nearly 25 per cent., while that for girls of thirteen years amounts to a daily loss of 3¼ hours! Children of six years were found who slept only 7 hours, and children of twelve years 4 to 6 hours.

In America N. C. Johnson (21) investigated the sleep of 600 pupils in Indiana high schools, finding a range in the averages for the four high school classes from about 8½ hours (among first-year girls) to 7½ hours (among fourth-year boys). Prof. W. H. Burnham (6) found an average of about 7 hours 53 minutes among 297 American normal school students, most of whom were young women between 18 and 22 years of age. A report by J. Mace Andress (2) of the sleep of 49 normal school students, who kept careful daily records of their sleep for fourteen successive days, gave an average somewhat more than one-half hour in excess of that found by Burnham.

THE PRESENT INVESTIGATION.

During the year 1911-1912 the writers carried out an investigation of the sleep of school children which had for its threefold purpose (1) to ascertain by more careful methods than had yet been employed the hours of sleep of children in the Western States of America, (2) to discover what correlation exists between hours of sleep and school success, and (3) to find the relation of hours of sleep to social status, home study and the possession of typical "nervous" traits. Through the generous co-operation of teachers and principals sleep records

were secured from 2692 children[2] between 6 and 20 years of age in the California cities of Stockton, San Jose, Alameda and Los Gatos; from Tempe, Ariz., and Monmouth, Ore.[3]

The records were secured by the teachers asking the pupils to fill out the following form immediately after the opening of the morning school session. (A somewhat simpler form was used for the first three grades:)

Name.....Age.....Grade.....

1. When did you go to bed last night?
2. How long do you think it took you to go to sleep?
3. When did you wake up this morning?
4. Did anyone have to wake you?
5. How many others slept in the same room?
6. How many others slept in the same bed?
7. How many windows are there in your bedroom?
8. How many windows were open during the night?
9. How wide were they open?
10. Did you sleep your usual amount last night? If not, was it more or less than usual? How much?
11. How many hours per week do you work outside of school?
    a. In school study at home?
    b. In elocution, music, drawing, etc.?
    c. In carrying papers, running errands or other work?

In order to insure uniform procedure in the collection of the records the following instruction sheet was given each teacher in advance:

(1) On the day before the sleep records are to be collected say to the children, just before dismissal of school in the afternoon, that you would like to know how many hours they sleep. Tell them to look at the clock "tonight" just as they go to bed and to write down on a piece of paper the exact time. (Make it clear that they are to make the record just as soon as they look at the clock.) Tell them also to look at the clock again as soon as they wake up next morning and to record the time on the same piece of paper. This piece of paper they are to bring to school next day.

[2]Through the kind co-operation of Dr. H. H. Goddard sleep records were also secured from 383 feeble-minded persons. These records will be summarized in part III of this study.

[3]The writers desire to express their hearty appreciation of the intelligent and careful assistance rendered by all who co-operated in securing the records and in the somewhat laborious task of supplying the information asked in the supplementary blanks.

(2) Make no other request or announcement. Be especially careful to avoid giving any suggestion as to the amount of sleep you think children should have. Say nothing about windows.

(3) On the following day as soon as school assembles distribute the question sheets and request the pupils to answer all the questions they can. Tell them not to try to answer those they are not sure about. Make it clear that no one will be reproached for having forgotten to make the records or for inability to answer any of the questions. Pupils are not to be encouraged to guess.

The amount of sleep for these 2692 persons is shown in hours and minutes in the following table:[4]

Age.	No. of records.	Av. No. hours of sleep.	Age.	No. of records.	Av. No. of hours of sleep.
6–7	37	11:14	13–14	250	9:31
7–8	147	10:41	14–15	244	9:06
8–9	218	10:42	15–16	201	8:54
9–10	291	10:13	16–17	167	8:30
10–11	307	9:56	17–18	117	8:46
11–12	282	10:00	18–19	43	8:46
12–13	312	9:36	University students	51	7:47

The most important fact in the above table is the striking excess of sleep among these children compared with the German and English children of Bernhard and Ravenhill. This excess amounts for most ages to between one hour and one hour and a half. At the same time the sleep averages found in this investigation fall from three-quarters hour to two hours below *the theoretical standards* set by Dr. Dukes. These points of difference are shown graphically in the following figure:

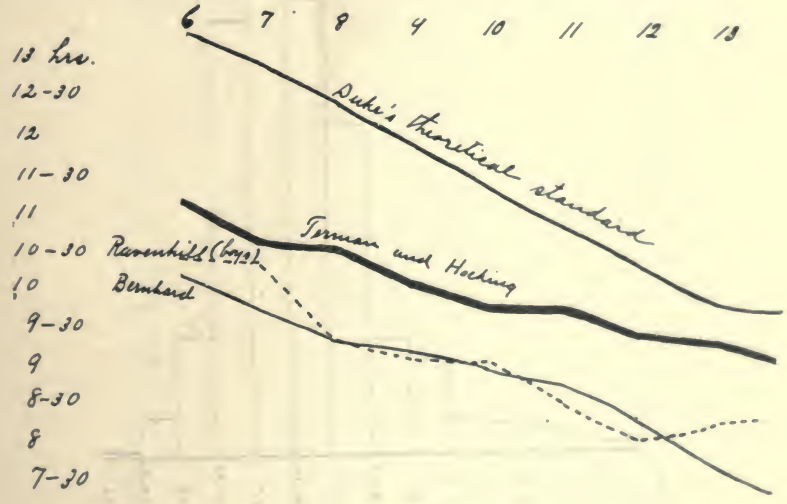

Figure 1.

[4]As the sex differences revealed by our results were exceedingly small, the figures for boys and girls have been combined in the above table.

For lack of space the curves of distribution for hours of sleep are shown only for ages six, nine, twelve, fifteen and eighteen.

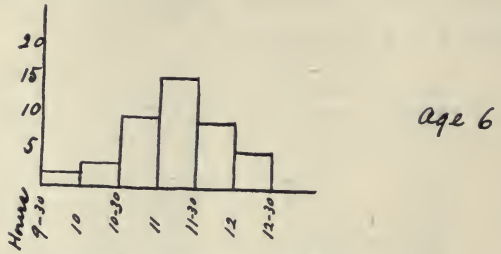

Figure 2. Curves of distribution of sleep.

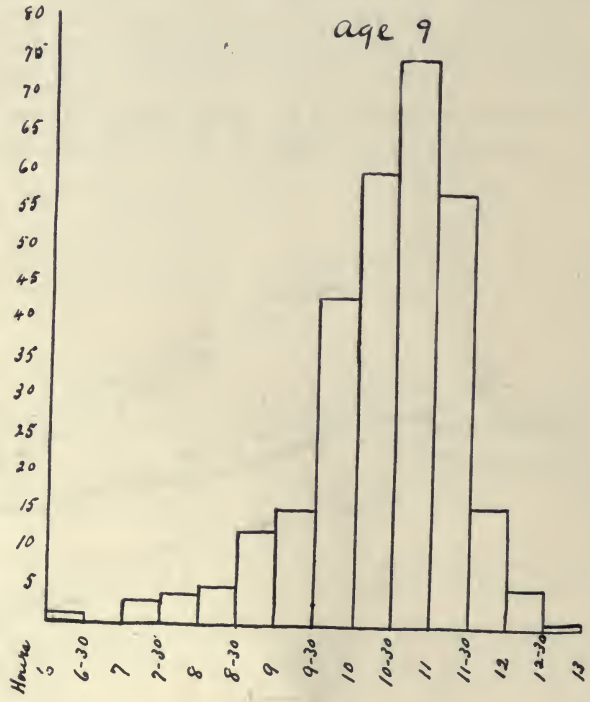

Figure 3.

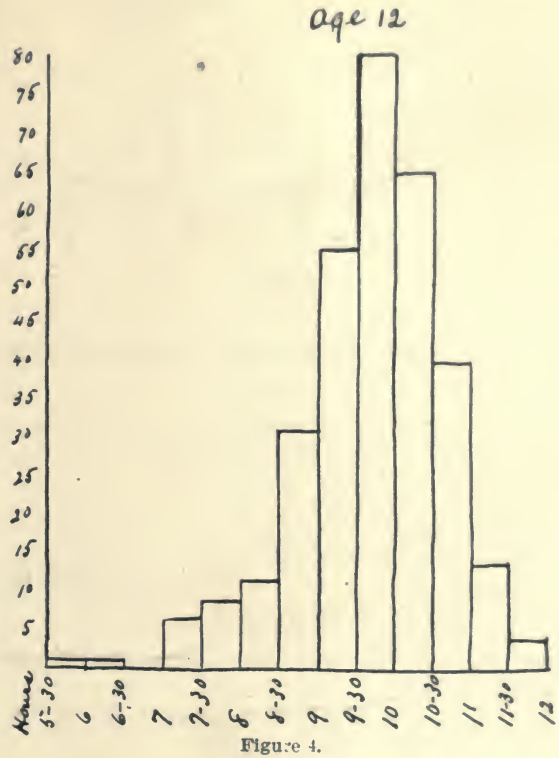

Figure 4.

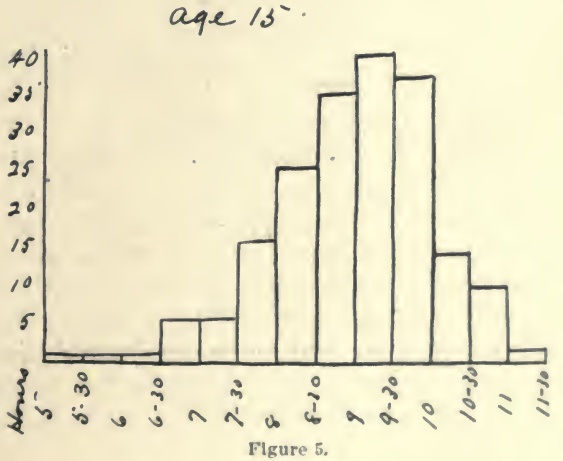

Figure 5.

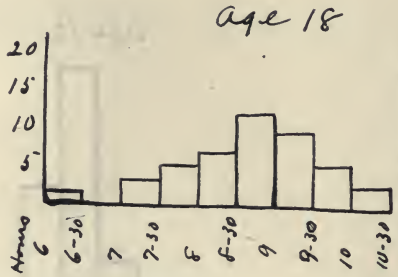

Figure 6.

A further idea of variation may be secured from the following figure:

Figure 7.

It is seen, therefore, that the minimum amount of sleep received by children in the western part of the United States almost reaches the *average* for German and English children. Why this astonishing difference? Three explanations are at hand. *First,* and perhaps most important, the climatic conditions of the sections from which our data were gathered are such as to permit a far greater amount of outdoor life than is possible (or at least customary) in Germany and England. *Second,* the home environment of our children is probably much superior to that of the children studied by Bernhard and Ravenhill. Their statistics were collected mostly in industrial cities, ours in the smaller and more comfortable cities in the best sections of the United States, where the extreme overcrowding and poverty so common in European industrial cen-

ters are hardly known. *Third*, the forenoon school session begins with us at nine o'clock instead of eight, as is customary in European countries. There may be other factors, but all these are without doubt contributory to our results.

Our averages would have been still higher had all the children been permitted to sleep until they awakened spontaneously. The following figures show the percentage in each year who had to be awakened:

Age...	6	7	8	9	10	11	12	13	14	15	16	17	18
Per cent. awakened.	21.2	19	23.3	19.1	22.8	20.3	23.6	24.7	26	31.6	38.7	39.9	47.7

The interesting fact here is the rapid increase in early adolescence of the number who did not wake spontaneously. The reason for this is not clear. It may be that adolescence tends to change the individual from the vesperal to the matinal type of sleeper. It is more probably due to the fact that a majority of the records above the age of fourteen were high school pupils who were required to do more evening work than the younger children.

Though it cannot be assumed that averages secured in this investigation furnish absolutely reliable norms of the amount children of various ages ought to sleep, it is believed that our standards are of more value for comparative purposes than any which have hitherto been available. The averages of Bernhard and Ravenhill probably show a subnormal amount of sleep, while the theoretical and traditionally accepted norms of Dukes are so high that we may safely dismiss them as worthless and misleading.

(*Continued in April Journal.*)

ECONOMICAL LEARNING.

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University of Missouri.

If a person sets to work to form a new habit, or establish a new set of associations, how long should his practice periods be and how often should he practice? What is the value of short periods of practice as compared with long ones? Should the practice periods be daily or on alternate days? Or, would practice once a week do as well? These two problems, of the length and frequency of practice periods, are of great practical significance to education. They were first raised, so far as I know, by Ebbinghaus (2) in his work with nonsense syllables. He found that in committing to memory nonsense syllables, it was better to distribute the learning over several days than to learn them all in one day. There was both a saving of time in learning and better retention, when the learning was spread out over several days. In the writer's laboratory, the same thing has been found true in logical memory. Since Ebbinghaus' work, other psychologists have confirmed his results. Jost found a saving of 15 per cent. in extending the learning of a series of syllables over three days, ten repetitions a day, as compared with 30 repetitions, in one day.

More recently, Swift (6) has raised the question of daily versus alternate day work, and, quoting Morrison, says that work on alternate days is better than daily work. But Morrison (4) performed no definite experiments to determine the matter.

Dearborn (1) reports some class experiments, in which 5 minutes practice twice a day is compared to 10 minutes once a day, to the advantage of the latter. Starch (5) compared four different distributions of a total of 120 minutes. He

used one 120-minute period, three 40-minute periods, six 20-minute periods and twelve 10-minute periods. He found the 10-minute period best, the 20-minute period nearly as good, the 40-minute period next in value and the long period of least value. Both Dearborn and Starch complicate the problem. Only one condition should be varied at a time. If we start out to settle the question of interval, we should keep the time constant, and if we try to settle the question of time, we should keep the interval constant. Dearborn does not compare 10 minutes a day with 5 minutes a day, but with 5 minutes *twice* a day, which is quite a different matter. Starch combines in one experiment four different lengths of periods with four different distributions of time. In such a case, how are we to know what is due to length of period and what to interval between periods? What, for example, would Starch's 40-minute group have accomplished by working once a day or twice a day? Moreover, neither Starch nor Dearborn measure the learning capacity of their subjects. Starch has 42 subjects in all, only 7 in the smallest group. The number in his different sections was too small for us to assume equal ability in the different sections. One must either use a large number of subjects in the different sections that are to be compared, or measure the learning capacity of his subjects. This we have learned by bitter experience. The problem was first taken up in our laboratory in the spring of 1910, when we had several subjects learn shorthand by several procedures, but were unable to explain the results because of failure to fractionate the problem. In the year of 1910-11, we continued work on the problem, and undertook to measure the learning capacity of the learners by giving various initial tests. They, however, proved inadequate for the purpose. Our next improvement in method was to give the subjects practice for one week in the same type of work that they were to have in the experiment proper. This proved inadequate for the reason of great differences in learning type. Some subjects learn fast for a week and then learn much more slowly, while others keep up their ratio of improvement for a long time. Our final method was to give a check experiment of the same length as the experiment proper. In the check experiment, the sub-

jects all use the same method; in the experiment proper, the subjects vary one factor, either time or frequency.

The Best Length of Period.

Method and Material.—For material, we invented 26 characters to take the place of the English alphabet. These characters are simple and easily made. On the first day of the experiment, the subjects spent 30 minutes learning the characters. Each person was allowed to choose his own method of learning them. On succeeding days each subject transcribed a psychological monograph into the new characters, all subjects working 30 minutes, each. They were told to work as fast as possible and do the work accurately. For a few days they were allowed to keep the key to the new alphabet before them. The practice was contineud for 17 days, including the first. Then a new alphabet was learned as before and the same matter transcribed into it. But instead of practicing 30 minutes at a time, one subject worked for 30 minutes, another for 15, another for 45 and another for 60 minutes. The work was continued as before for 17 periods. Now, there are two separate questions involved in this experiment: (1) If one practices once a day for 16 days, what is the effect of the length of period? (2) If a person has a definite amount of time to devote to practice, should he spend it in short periods, distributed over many days, or in long periods in fewer days? In settling either of these questions, we can treat the data in various ways. We can determine the average speed for the experiment or compare the final speed with the initial speed, etc. We give below two tables. In one the final speed attained in one procedure is compared with that attained in the other, and in each case final speed is not taken absolutely but as compared with the initial speed. The average speed for the last two days is subtracted from the average speed of the first two days, this speed is multiplied by 100 and divided by the initial speed, giving the percentage of improvement.

TABLE I.—*Comparison on basis of average speed.*

Subject.	Method.	Improvement.
Edm	15 min.	4.8 per cent. less than in check experiment.
Ros	30 min.	30.3 per cent better than in check experiment.
Moo	45 min.	20.6 per cent better than in check experiment.
Var	60 min.	22.9 per cent better than in check experiment.

In table I, the average speed made in 16 days' practice, using four different lengths of practice period, is compared with the sped made in 16 practice periods when all subjects used the same length of period, *i. e.*, 30 minutes. Using the average speed for the whole period as our criterion, it is plain that 15 minutes practice daily is not so effective as the longer periods. The 30-minute period seems best of all. There is an actual falling off in the two longer periods.

TABLE II.—*Comparison on basis of final speed attained.*

Subject.	Method.	Improvement.
Edm	15 min.	12.7 per cent less than in check experiment.
Ros	30 min.	6.1 per cent less than in check experiment.
Moo	45 min.	3.3 per cent more than in check experiment.
Var.	60 min.	5.7 per cent less than in check experiment.

It will be observed from table II, that on the basis of final speed as compared to initial speed, 30 minutes practice is better than 15; 45 is better than 30; but an hour is no better than a half-hour. It is evident from a comparison of table I with table II, that if we consider the final speed attained, the 15-minute period does not appear at so great a disadvantage as it does when we consider the average speed of the whole experiment. This is probably because a subject using a 15-minute period makes slow progress early in the experiment, but in the latter part of the experiment, the 15 minutes are about as effective as the longer periods. This is borne out by a comparison of the speed attained in the last half of the two experiments with the speed of the first half, *i. e.*, by a comparison of the averages of the two halves. Such a comparison shows that a person using the 15-minute interval makes slow progress at first but in the last half of the experiment, makes an average that compares favorably with that made in the longer periods.

Now, the second question, in putting in the same absolute amount of time at practice, what is the best way to distribute it? In short daily periods or long daily periods? In answering this question, we can consider only four hours work, for that is the amount put in by the 15-minute subject. Therefore, we find the average speed and the final speed for four hours work in the check experiment and the same for the experiment proper.

TABLE III.—*Comparison on basis of average speed, same amount of time.*

Subject.	Method.	Improvement.
Edm	15 min.	22.3 per cent better than in check experiment.
Ros	30 min.	36.1 per cent better than in check experiment.
Moo	45 min.	25 per cent better than in check experiment.
Var	60 min.	14.8 per cent better than in check experiment.

It is plain from table III, that if we consider the average speed as our criterion, the 30-minute period is the best length for daily work. The 15-minute period is too short and the 45 and 60-minute periods are too long to get the best returns.

TABLE IV.—*On basis of final speed as compared with initial speed, same amount of time.*

Subject.	Method.	Comparison.
Edm	15 min.	4.9 per cent less than in check experiment.
Ros	30 min.	18.1 per cent more than in check experiment.
Moo	45 min.	5.4 per cent less than in check experiment.
Var	60 min.	45.5 per cent less than in check experiment.

Table IV warrants the same conclusion as table III. Thirty minute periods are best. Fifteen minutes are too short, 45 minutes are too long, and the disadvantage of an hour is plainly apparent.

THE BEST INTERVAL BETWEEN PRACTICE PERIODS.

In comparing daily with alternate day work, the length of practice periods was kept constant with six subjects (Mil, Hig, Bau, Hal, Lon and Epp). With four subjects, however, different lengths of practice periods were used in the check experiment, but for all, 30 minutes was the length of practice in the experiment proper. In the check experiment Mag and Wat used 20-minute periods and Fie and Fin used 10-minute periods. The subjects should be compared in pairs, not only because of differences in the check experiment but because for each pair, the time of practice and other conditions were kept constant.

TABLE V.—*Improvement compared, daily and alternate days.*

Subject.	Method.	Gain or Loss.	Method Favored.
Mil	daily	17.2 per cent loss	daily
Hig	Alt. days	22.6 per cent loss	
Bau	daily	15.4 per cent loss	daily
Hal	Alt. days	32.3 per cent loss	
Lon	daily	12.0 per cent gain	daily
Epp	Alt. days	2.1 per cent loss	
Wat	daily	16.5 per cent gain	daily
Mag	Alt. days	5.1 per cent gain	
Fie	daily	5.2 per cent gain	daily
Fin	Alt. days	4.6 per cent loss	

The subjects shown in table V practiced for 16 periods in the experiment proper, except the last four, who practiced for 30 periods. In not a single case does practice on alternate days prove better. There is a silght advantage in favor of daily practice. But, just as when practice is continued for some time, short periods are probably as valuable as long ones, it may be that in the later stages of practice, the intervals might be lengthened without loss to the learner. But surely, if our figures prove anything, there is no advantage in the early stage of habituation, of practicing on alternate days.

In comparing daily with twice-a-day practice, six subjects were used, three working twice a day and three once a day. Those working twice a day, worked once early in the morning and once in the afternoon at 4 o'clock. Both groups were given a control experiment covering the same length of time as the experiment, which was for 15 half-hour periods. The results are shown in table VI. For sake of brevity, the results are given for groups only, and on the basis of final speed attained. The final speed is determined by finding the average of the last two practices.

TABLE VI.

Group	I. Sec. per word in check exp.	II. Sec. per word in exp.	Ratio of II to I.	Method favored.
Daily	5.68	3.68	.65	
Twice Daily	5.83	4.07	.70	Daily

It will be seen that the results show a slight advantage for once a day practice, but the difference is very small. The afternoon practice was after the university work of the day, and the students were probably somewhat more fatigued than in the morning. It is possible that if the subjects were in as good condition in the afternoon as in the morning and could maintain the same interest in the work, the afternoon practice would be as profitable as the forenoon practice. At any rate, this might be true in the early stage of habituation.

If the twice-a-day group is given the same number of days practice (twice as many periods) as the daily group, the advantage of twice-a-day work is plain. In 15 days (30 periods) the group practicing twice a day attains a speed which is only

53 per cent. of the time per word in the check experiment. The time per word of the daily section at the end of 15 days was 65 per cent of the time per word in the check experiment. The accompanying curves (Plate I) show the once-a-day method compared to the same number of *periods* and the same number of *days* in the twice-a-day method. In studying these curves,

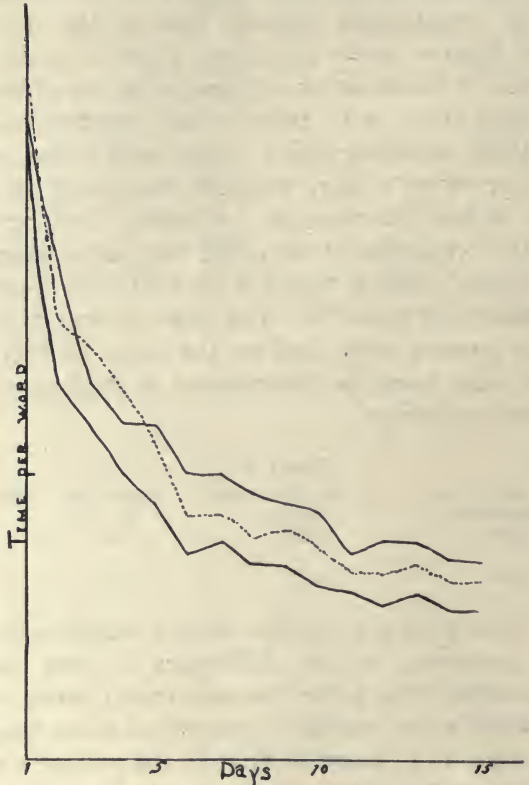

PLATE I.

Learning curves, once a day and twice a day. The dotted curve shows the record of the section working once a day. The upper solid line shows the record of the twice-a-day group practicing for the same number of periods as the once-a-day group. The lower solid curve shows the record of the twice-a-day group practicing for the same number of days as the once-a-day group, i. e., the upper line shows the same amount of hours as the dotted line, the lower curve shows the same number of days, but twice as many hours as the dotted line.

it must be remembered, however, that the twice-a-day group is 2.6 per cent. slower than the other group, as shown by the check experiment in table VI.

This experiment has also been carried out with a group of third grade school children, but in this case the practice was in addition, according to a definite method and careful procedure. The children were given an initial test of ten minutes in addition, and on the basis of this test divided into two groups of equal number and equal ability. One group was given ten

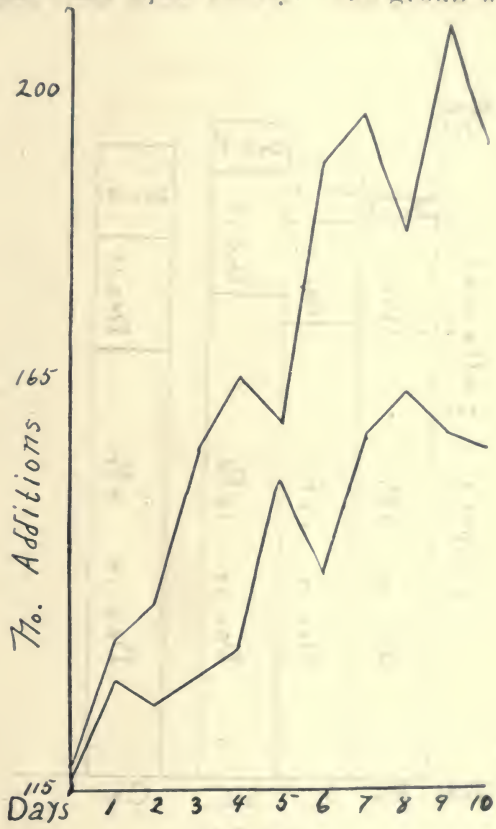

PLATE II.

Learning curves. Third grade children drilled in addition. The upper curve shows improvement of section working once a day, 10 minutes, for 10 days. The lower curve shows improvement of section working 10 minutes twice a day for 5 days.

minutes practice in addition for two weeks, in the morning only. The other group practiced in the morning and also in the afternoon for one week only. The results, shown in the curves of Plate II, are decidedly in favor of practice once a

day. The difference between the groups is much greater than was the case with the adults. It is probable that the children were much more fatigued in the afternoon and had much less interest as compared to the morning work, than was the case with the adults. It should be noted, however, that there are many possibilities of error in such work with school children,

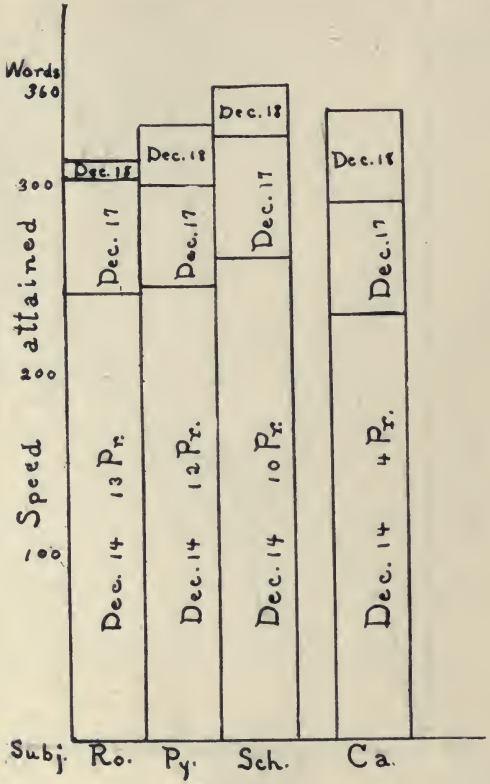

PLATE III.

although the experimenter used every precaution possible. This experiment was conducted for me by Miss Mabel M. Richards, principal of the Jennings School, St. Louis. I am having it repeated in several schools.

Our next step in the study of the best distribution of time was to perform as many half-hour periods of practice as possible in one day, resting a half-hour between practices. I

therefore began one morning, and practiced in this way for 14 half-hour periods in one day. The practice consisted in learning an alphabet as in most of the experiments above noted. One week later I repeated the experiment, using a different alphabet, and working with three other subjects. One subject for four periods only, the rest of us working all day, for 13, 12 and 10 periods. My first all-day experiment had shown that there was little improvement after the third or fourth period. My chief object in this repetition of the experiment was to determine whether a person who worked for four periods only, would get as much value from the four

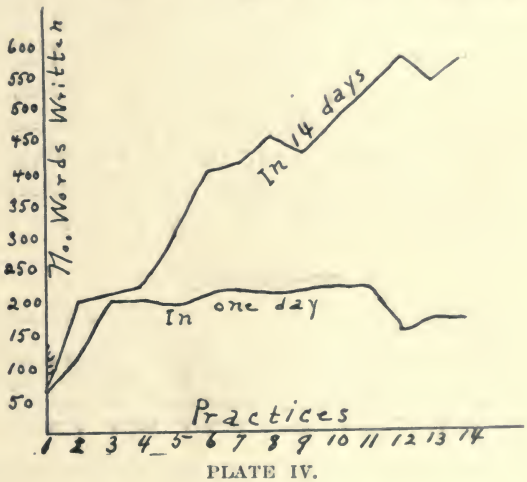

PLATE IV.

practices as the other subjects did from all-day practice. To test the effects of this first day practice, we worked for 30 minutes again two days later, and once, three days later. It will be seen from Plate III, that the person practicing only four times got nearly as much value from the practice (as shown by the two later tests) as did the subjects who worked all day. A check experiment showed the four subjects of this experiment to have about the same learning capacity. Perhaps a more striking comparison of the relative values of distributed versus concentrated practice is shown in the curves of Plate IV. The lower curve shows my own record for one day, fourteen practices, and the upper curve shows what my

record would be if the practices were distributed over 14 days. The upper curve is the actual curve of a subject (Sch) of the same learning capacity as myself, and working once a day for 14 days.

On the whole, our experiments warrant some such conclusion as the following: In habit formation an adult can practice profitably for something like 30 minutes daily. The length of time for practice doubtless varies with individuals and with the stage of fixation of the habit. If practice is extended beyond 30 minutes, there may be some return for the extra time but it is relatively small. It is quite probable that in the later stages of habituation, the length of practice period could be shortened and the interval lengthened with practically as much return. A second practice on the same day is not quite as beneficial as the first practice. After a few practices, further practice on the same day is useless. The next step in the experimental study of the economy of learning should be to determine the relative value of practice of every length of period from one minute up to an hour.

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VALUE OF DAILY DRILL IN ARITHMETIC.

F. M. PHILLIPS.

Submitted by Irving King, University of Iowa.

The purpose of this investigation was to secure data from which to estimate the value of daily drill in definite lines of school work. The lines selected were the fundamental operations of arithmetic, and work in arithmetical reasoning. The work was carried on in the sixth, seventh, and eighth grades of the public schools of Granite Falls, Minn. A similar test, made recently by J. C. Brown,[1] suggested this study.

During the month of March, 1912, the writer gave the tests in fundamentals and in reasoning known as the "Stone tests," and described on pages 10-12 of Stone's "Arithmetical Abilities; Some Factors Determining Them." These tests were given to all the pupils of the above grades. The method of grading the papers was the same as that suggested by Stone, (pp. 16-17).

The tests were printed and distributed face downward among the pupils. At a given signal they turned the sheets over and began work. Exactly twelve minutes were given for the test in fundamentals, and fifteen minutes for the test in reasoning.

After the papers were graded, the pupils of each grade were divided into two groups of as nearly equal ability as possible. This was done by selecting the two highest and putting one of them in group one, and the other in group two; then selecting the two next in order, and so on down the list, thus getting about an equal number in each group, and getting the best and the poorest in each group. Then by a method of casting

[1]This Journal, Vol. II, p. 81.

lots, one group became a drill group and the other a non-drill group.

Those in the drill groups of each grade were given ten minutes' drill daily upon the fundamental operations of arithmetic, both oral and written, and upon reasoning problems usually designated as mental arithmetic. The other group of each grade was given no drill at the time the drill group was at work, but had its regular class work in arithmetic.

The work with the drill group was conducted by certain students of our Training Department, who were some of its best prospective teachers. The writer took special care to supervise the work, and to visit the drill classes as often as convenient. The work was done in class rooms outside of the regular grade rooms. These student teachers did not know the purpose of the drill work or the nature of the "Stone tests."

This drill was carried on for two school months, when a second test was given. The test in fundamentals was the same as given in the first test, and the reasoning test was similar to that given in the first test.

The method of grading was the same as that used in the first test. The highest grade possible in the fundamental test is 59, and in the reasoning test is 17.2. The papers of all those who were not able to take tests were laid aside, and the data used here were drawn only from the papers of the regular students who were in school all of the time, thus giving a fair basis for the investigation. The papers of 69 pupils are used; 33 boys, and 36 girls; 34 were in the drill group, and 35 in the non-drill group.

A comparison of the results of these two tests will be appended here by grades. When both the fundamental and reasoning abilities are considered, the grades of the reasoning test are multiplied by the coefficient, 3.43, which factor expresses the relation between 59 and 17.2. This is merely to give both tests equal standing in getting the conclusions.

Per cent. of improvement of the drill and non-drill sections in the first and second tests. "1" indicates drill sections; "11" non-drill section.

6th grade, 1, Fundamentals, 45 per cent.
6th grade, 1, Reasoning, 55 per cent.
6th grade, 11, Fundamentals, 54 per cent.
6th grade, 11, Reasoning, 36 per cent.
7th grade, 1, Fundamentals, 22 per cent.
7th grade, 1, Reasoning, 29 per cent.
7th grade, 11, Fundamentals, 10 per cent.
7th grade, 11, Reasoning, 17 per cent.
8th grade, 1, Fundamentals, 25 per cent.
8th grade, 1, Reasoning, 15 per cent.
8th grade, 11, Fundamentals, 16 per cent.
8th grade, 11, Reasoning, 12 per cent.
All 1 groups, Fundamentals, 31 per cent.
All 1 groups, Reasoning 33 per cent.
All 11 groups, Fundamentals, 27 per cent.
All 11 groups, Reasoning, 22 per cent.

The improvement in fundamentals of the combined drill groups was 15 per cent. greater than of non-drill groups. In reasoning the drill groups improved 50 per cent. more than the non-drill groups.

In every case, one excepted, the drill groups made a better gain than did the non-drill groups. In the sixth grade the non-drill group made a better increase in fundamentals. The greatest gains were made in the sixth grade, and the smallest in the eighth.

While these figures show a substantial and a satisfactory gain, they do not show in what part of the work the gains were most marked. For this purpose the following data are attached:

The gain of drill group in the three addition problems was 15 per cent.
The gain of non-drill groups in the three addition problems was 17 per cent.
The gain of the both groups in the three addition problems was 16 per cent.
The gain of the drill group in the multiplication problems was 37 per cent.
The gain of the non-drill group in the multiplication problems was 15 per cent.
The gain in the both groups in the multiplication problems was 25 per cent.

Thus it is seen that very little gain was made on the three problems in addition, the non-drill group showing the greater gain. While in the multiplication exercises a great gain was made, the drill group making nearly three times as much gain as did the non-drill group.

The sex of the student is considered in the following table:

In fundamentals the boys had 765 points in the 1st test, 1007 in 2nd.
In fundamentals the girls had 947 points in the 1st test, 1184 in 2nd.
In reasoning the boys had 714 points in the 1st test, 926 in 2nd.
In reasoning the girls had 732 points in the 1st test, 884 in 2nd.
The av. No. points of boys in fund was 23.2 in 1st test and 30.5 in 2nd.
The av. No. points of girls in fund was 26.3 in 1st test and 32.9 in 2nd.
The av. No. points of boys in fund. was 23.2 in 1st test and 3.05 in 2nd.
The av. No. points of girls in fund. was 26.3 in 1st test and 32.9 in 2nd.
The av. No. points of boys in reasoning was 21.7 in 1st test and 27.9 in 2nd.
The av. No. points of girls in reasoning was 20.39 in 1st test and 24.6 in 2nd.
In fundamentals the boys made a gain of 30 per cent.
In fundamentals the girls made a gain of 25 per cent.
In reasoning the boys made a gain of 25 per cent.
In reasoning the girls made a gain of 21 per cent.
In the addition problems the boys made a gain of 18 per cent.
In the addition problems the girls made a gain of 14 per cent.
In multiplication the boys made a gain of 28 per cent.
In multiplication the girls made a gain of 23 per cent.
The boys made a gain of 21 per cent. more in fundamentals than the girls.
The boys made a gain of 22 per cent. more in reasoning than the girls.
The boys made a gain of 30 per cent. more in addition than the girls.
The boys made a gain of 24 per cent more in multiplication than the girls.

The following table gives the medians and average deviations of each group for each grade in the fundamental tests. "1" indicates first test, and "11," indicates the second test.

	1 Med.	1. Av. Dev.	11. Med.	11 Av. Dev.
6th Drill	21.5	4.58	29.5	4.92
6th Non-drill	19	4.61	31	4.07
7th Drill	23	3.33	28	4.44
7th Non-drill	23.5	4.20	27.5	4.40
8th Drill	27	4.31	34	7.62
8th Non-drill	31	5.33	35	5.08
All Drill	24.5	5.28	30	6.35
All Non-drill	25	6.40	31	5.71

The median as here used expresses the central tendency. It is more easily found than the average grade, and is less likely to be affected by errors and chance results. The average deviation was found from the median, and denotes the variation from uniformity.

In concluding, special attention might be called to some of the data and the tendencies noted.

1. There is a substantial increase in abilities of both drill and non-drill groups during the two months between the tests. Only five pupils made a less grade in fundamentals in the second test than they did in the first. Fifteen made a smaller score in the reasoning problems.

2. The drill group made a much better gain than the non-drill group, being 15 per cent. better in fundamentals, 50 per cent. better in the reasoning tests, and 31 per cent. better in the combined tests.

3. The median increased in the second test in all groups tested, the increase varying from 12.9 per cent. to 63.2 per cent.

4. The average deviation was usually greater in the second test than in the first test, there being, however, less deviation in the non-drill groups.

5. The coefficient of variability is quite generally less in the second test than in the first test. This may mean that teaching tends to produce type forms, or that a given grade, or a given school tends to assume a standard of attainments. Here is a good problem for further investigation.

6. The girls did better than the boys in the test in fundamentals.

7. The boys did better than the girls in the tests in reasoning abilities.

8. The boys made a better gain during the time between the tests than did the girls, in all lines of work, the gain being about 24 per cent. over that of the girls.

EDUCATIONAL PSYCHOLOGY AT THE CLEVELAND MEETING OF THE AMERICAN PSYCHOLOGICAL ASSOCIATION.

BIRD T. BALDWIN,

Swarthmore College.

Of the fifty-seven papers on the program of the last session of the American Psychological Association and its joint meetings held at Cleveland, December 30 to January 1, at least a score or more have a specific bearing on educational psychology and experimental education. For convenience of discussion the papers may be grouped around the problems in *general psychology,* including among other subjects that of *Ideo-motor action* by President Thorndike, *Behavior as a psychological category* by Angell, *Heredity* by Cattell, and *Physiological psychology* by Dearborn (G. V. N.); *religious psychology,* including papers by Leuba and Krueger on *magic* and *religion; abnormal psychology,* including discussions by Aikens on *amnesia,* Southerd on *Structure versus function in psychopathology,* and the *Psycho-physiological effects of a prolonged fast* by Langfeld; *animal psychology,* including experimental studies in *Delayed reactions* by Hunter, *Reactions to a temporal series of stimuli* by Gregg and McPheeters, *Sound discrimination* by Shepherd (W. T.), *Vision* by Tugman and Haggerty, *Instinct* by Shepard (J. F.) and Breed, *General intelligence* by Yerkes and Bassett; and *Educational psychology,* including psychological tests for evaluating stages of mental development or progress in economy of learning in crminal women, delinquent girls, feeble-minded children, normal children and adolescents; tests in writing and tachistoscopic reading; reactions in methods of measuring association time; standards of mental efficiency, general mental tests, and the reliability of school grades; and Stoelting's exhibits of psychological apparatus and tests.

The papers in general psychology by Thorndike and Angell will have a marked influence on the presuppositions and categories of educational psychology. The former sets forth in a forceful and lucid manner the thesis that "experimentally ideas of acts do not *per se* produce them." The theory of ideo-motor action as held at present by the majority of psychologists is a relic of teleological thinking and is a direct descendant and homologue of primitive man's belief in a sympathetic magic. The latter writer maintains, with equal clearness, but without special experimental data, that "theoretically it should be possible to state differences of mental condition in terms of overt behavior." While the fallacies of the introspective method differ little in kind from those of other sciences the tendency to discount this method is a wholesome one "in so far as it looks toward the betterment of methodological procedure. It is unprofitable as it proposes to do away with resort to introspection."

In his elaborate paper on "*Families of american men of science,* Cattell makes a distinct contribution to the study of heredity, giving eighteen detailed tables in which he shows, among other results, that of the 917 families listed 660.5 are of American parentage. In the occupations of the fathers of the scientific men professional men rank first (43 per cent.), including in the following order—clergymen, teachers, physicians, lawyers and other professions. The average age of cians, and lawyers. The average age of marriage for the father was 27.9 years, for the mother 22.8 years. The fathers were on an average 34.9 years old at the birth of the sons and the mothers 29.7 years. There is a tendency for both the wives and men of science to marry a little later than their parents, and to have, on the average, smaller families; the families from which scientific men come have on the average 4.64 children, and married scientific men whose families are complete have on an average 2.22 children. The central theme of this paper furnished a discussion of the causes and effects of decreasing birth rates and death rates and the influence of heredity and opportunity in determining scientific advancement. Space will not permit, at this time, a discussion of the papers on religion and magic, the *Study of man* by Ladd, nor the *Rela-*

tion between the anschaulich and the unanschaulich contents of consciousness and the *Functions of a visual image in memory and imagination* by Martin. Neither will it be possible to do more than to mention in this communication the papers on *imagery* by Ogden and by Fernald, nor the work in *vision* experiments by Ferree, by Geissler and by Adams, all of which furnish data that the educational psychologist will necessarily be required to take into consideration in his analysis of the elements of consciousness and the process of learning. Meyer, on the frequently recurring problem of *left-handedness,* defends the thesis that during the first few months of life left-handedness is a necessary accompaniment of right-handedness of adult life, the change occurring approximately between the sixth and fifteenth months, during which there is a period of ambidexterity. This is explained (on *a priori* grounds) by the fact that left-handedness in the infant seems to have its neurological basis similar to that of right-handedness in the adult.

The papers on animal psychology will make an important contribution to this important field of psychology, and, while several of the papers will throw light on the nature of learning in animals, and therefore *probably* in children, the two which impress the writer as being of particular significance to teachers are those of Hunter on *Delayed reactions in animals and children* and the *Relative effects of maturation and use on the deevlopment of an instinct* by Shepard (J. F.) and maturation. Practice was prevented by confinement in representative function in the behavior of animals and children. He found, by means of a series of control tests with rats, dogs, raccoons and children, that in successful responses some guiding cues must be developed within the subjects' bodies. While the behavior of cats and dogs can be stated in terms of habit, the raccoons require an ideational function whose content may be either sensory or imaginal, according to one's general theory of consciousness. The maximal delays of the reagents were: rats 6″-9′; dogs 15″-5′; raccoons 15″-30″; children 50″-20′. Shepard and Breed observed "the pecking instinct of chicks" and constructed for a standard, a curve of development showing the "improvement in accuracy of the pecking co-ordination from birth to the twenty-fifth day." An

attempt was then made to determine, by testing twenty-three chicks, the relative contribution to the improvement by use and maturation. Practice was presented by confinement in a dark room, the chicks being fed artifically. "The most interesting features of the results are the equally poor initial records of the chicks and the rapidity with which they attained the normal level of accuracy. We may accordingly regard the first two days of the curves as the necessary practice component and the remainder a record of maturation."

Experimental educational psychology is rapidly acquiring a more definite scope and refinement of methods of procedure. Since the remaining papers belong primarily in this field they will be of particular interest to the readers of THE JOURNAL. Monroe finds, after testing three hundred girls and three hundred boys between the ages of three and six years in matching and naming the six standard colors in the Binet test, that from three to six the girls excel the boys in color perception tests, except at the age of five, and in the color naming tests the girls excel the boys at all ages. In regard to the Binet tests the sex differences are not so marked, the girls leading the boys in the third year and in the seventh year, and the boys leading the girls in the fifth year. On retesting 82 children by the Binet tests (1911 revision) after an interval of one year, Berry concludes there is an average gain in rank of one year, with an average deviation of .26 of a year for normal children, with a gain of .96 of a year for those who tested below normal age, 1.02 for those at age and 1.17 years for those above age. Of the 40 mental defectives the average gain was .5 of a year with a deviation of .31 of a year, with an individual variation of a loss of .6 of a year to a gain of 1.2 years. He finds a close correlation with the results of the original tests and the "average gain of the normal children who tested above age, in 1911, was 20 per cent. greater than that of the children who tested below age in 1911; that the average gain for the defectives of 15 and under was 50 per cent. greater than for those above that age." Goddard discovers, after three annual testings of 352 feeble-minded children, that 109 remain absolutely the same, 232 have not varied more than two points in the two years and twenty-two

have gained more than five points—that is more than one year in two years. Of the 2000 public school children 464 have been retested three times, and of these 49 per cent. make normal or more than normal progress—five points per year; 47.2 per cent. make approximately one-half normal progress; 1.25 per cent. make no progress. These facts, the speaker claims, are strong evidence that "the scale in the hands of a trained person is thoroughly reliable." This optimistic viewpoint is vigorously challenged by Weidensall in her paper on *Psychological tests applied to criminal women,* and the writer deeply regrets that no abstract of her paper has been obtainable.

In a very comprehensive *Report of a series of tests administered to 800 fourteen-year-old children,* Woolley and Fischer make the following generalizations on children leaving school to go to work: the girls are superior to the boys in height, weight, and perfection of co-ordination, while the boys are superior to the girls in strength, rapidity of motion, and vital capacity; the girls are somewhat superior to the boys in all the mental tests; the tests of physical development show a slight correlation with grade, and the tests of mental ability a more marked correlation. Jones tested delinquent girls for the purpose of determining their educability. The five series of tests represented types of association of controlled association, the form-board, crossing out A's and rapid naming of words. The results show it is possible to make a classification of the subjects which, the writer optimistically concludes, "seemed fully as accurate as the results obtained by applying the Binet scale. It is far more easily and more rapidly applied with just as good results." B. T. Baldwin's paper is a comparative study of *The progress of learning of adolescent delinquent white and negro girls* as shown by a wig-wag code adapted for this purpose and applied for sixteen consecutive days. He finds this type of material furnishes a very reliable means for evaluating learning capacity irrespective of school standing for children who can read. The 76 practice curves show a wide range of individual differences and significant periods of acceleration and retrogression. As a group, the negro girls are inferior to the white girls; they accomplish less work, are less accurate, less easily enthused

and are more controlled by moods. In a *Pictorial completion test* Healy describes a picture type of form-board from which parts are cut, these parts to be replaced by the examinee. With individuals above nine years of age the ability to complete these spaces varies little among those of the same grade of mental ability; below nine years of age, and for the group below fair or ordinary ability, the type and number of final errors rapidly changes. Schmitt tested 150 normal children with five tests described in Healy and Fernald's monograph. The results indicate that the child's ability to deal successfully with abstractions of representative material is deevloped somewhat earlier than his ability to deal in a planned way with the functional necessities in concrete material. The papers given by Pyle will apear in full in this JOURNAL.

School subjects received little attention at these meetings, but Freeman's paper called atention to the *Need of a dual standard in testing handwriting,* since it is not only essential to test the quality and speed of writing on account of their practical importance, but also on account of variations which are found in different school grades in the same school, in the same grade at different times of the year, and in different schools or individuals when compared with one another. *Individual differences in the attention fixated during reading and a comparison of differences in types of reaction* furnished the subject of Pinter's investigation. It was found "observers could be classified according as they tended to fixate sharply or to let their attention fluctuate, and characteristic differences of the manner of reading resulted from these different forms of attention." Children tend, in most cases, toward the fluctuating type. There are sensory, motor and natural types of reactors, and the mean variation of the first two is comparatively small when compared with the latter; the fluctuating reader approximates to the type of natural reactor and allows his attention to wander between the stimulus and the reaction, while the fixating reader fixates either the stimulus or the reaction.

In his work on the *Reliability and distribution of grades* Starch calls attention to the problem of "How small steps are distinguished and what proportion of persons should

ordinarily receive the various grades." The former depends on the reliability of the assignment of grades, and was determined by having two papers in English graded by 142 teachers, and one in geometry by 118 teachers. A very wide variation was found, ranging from a mark of 28 to 92 in the case of the geometry paper. In order to test the factor of different standards in different schools, ten freshman English papers were graded by ten English instructors in the same institution "with a mean variation of 5.3 which is not materially different from the above variation." The individual standards in marking were then eliminated through a system of weighting and a comparison made with the accuracy of measurement in another field.

Though there is a strong tendency for educational psychology to differentiate its field more and more from general psychology of the introspective and philosophical type, the writer believes it is neither possible nor desirable to try to formulate or teach educational psychology without a substantial background in the science which is the source of our data and methods. General psychology furnishes the substratum on which we must build, with equal detail of experimental procedure, the new sciences of educational psychology and experimental education.

COMMUNICATIONS AND DISCUSSIONS.

EDUCATION IN THE MIDDLE WEST.

A Conference of Professors of Education of the Middle West Universities and Colleges met at Lincoln, Nebraska, on Thursday, Friday and Saturday, December 19, 20, and 21. The meeting was well attended, twenty-five representatives being present from the schools of eight States. The program consisted of papers and discussions upon a variety of subjects. The principal numbers upon the program were the following:

"Does the Present Undergraduate Course in Education Accomplish Its Purpose in Training Teachers?" by Professor W. A. Jessup, University of Iowa.

"A College Graduate Teachers' Certificate Valid Throughout the Middle West," by Professor J. O. Craeger, University of Wyoming.

"The Vitality of Teaching," by Professor W. M. Jones, University of South Dakota.

"What Has Been Done Along These Lines Up-To-Date," by Professor B. E. McProud, Nebraska Wesleyan University.

"School Observation; What It Should Seek to Accomplish; How to Administer It," by Professor Frank E. Thompson, University of Colorado.

"Aim of Practice Teaching, and What It Is Accomplishing," by Professor Charles Fordyce, University of Nebraska.

"Practice Teaching; Its Administration in the University," by Professor J. L. Meriam, University of Missouri.

The first meeting, held on Thursday evening, was very informal. In the absence of Professor Foster, who had arranged the Conference, Dean Charles Fordyce, University of Nebraska, presided. Professor J. O. Craeger led in a discussion of the possibility of providing a college graduate teachers' certificate valid throughout the Middle West. The extreme inconvenience of the present lack of recognition by one state of college diplomas or of certificates issued in other states was pointed out and statistics were presented showing in detail the exact situation throughout the country. Professor Craeger laid emphasis upon the necessity of concerted action in this matter, both by the schools of education and by the state departments throughout the Middle West. However, attention was directed to the fact that no action upon this matter should be permitted to lower the average standard of qualifications demanded of teachers. On the contrary, any action taken should be such as tends to raise both

the average standard of qualifications and the average efficiency of teachers.

The second number of the evening was a general discussion, led by Professor Jessup of Iowa upon the subject of the Present Typical Undergraduate Course in Education. Professor Jessup raised a number of interesting questions, among them the following: Does the customary course in the history of education aid the teacher in her actual work in the school room? Might it not better be replaced by a course upon present-day problems with particular reference to high schools? In how far is practice teaching in a training school beneficial to the prospective high-school teacher? Is such practice-teaching more successful when done in a city high school or when done in an experimental or model school provided for that purpose by the university or college? It was pointed out that the advantage of training in a city high school consists mainly in the fact that conditions there are frequently more nearly normal than in the experimental or model school; usually, also, the equipment is better in city schools as respects gymnasiums, laboratories and libraries. On the other hand, practice-teaching in a high school is frequently unsuccessful because of the lack of full authority on the part of the University or college. Complications and misunderstandings involving the authorities of the University and high school are likely to arise. In general the concensus of opinion was that practice-teaching is highly beneficial to the prospective teacher, but that the specific arrangements of any school must depend upon local conditions. It was further suggested by Professor Jessup that arrangements might be made with the principals of large high schools whereby picked graduates from the University should be granted teaching fellowships paying two or three hundred dollars. According to this plan, recent graduates, during a fifth year, would spend two or three hours daily in actual teaching in a large high school under the supervision of the principal. This work would be counted toward the Master's degree and would in many respects resemble the *Probejahr* of the German system. Finally Professor Jessup called attention to the fact that training of teachers should be such as to meet the needs of the few men who at present choose this work either permanently or temporarily.

Friday morning was devoted chiefly to visiting the practice school of the University of Nebraska. Demonstration classes were held in a variety of subjects and the actual work of the training school

was inspected in detail by the visitors. At the regular meeting of the Conference held at 11:00 o'clock, Professor H. H. Foster of Ottawa University was chosen chairman and C. H. Williams of the University of Colorado secretary. At this meeting a paper was read by Professor W. M. Jones of the University of South Dakota upon the subject of The Vitality of Teaching. In this he emphasized especially the need of appealing to the fundamental interests of the child. Motivation was discussed in detail, particularly in relation to the development of the sense of right and wrong. A second paper was read by Professor B. E. McProud of Nebraska Wesleyan University upon the subject *What Has Been Done Along These Lines Up-To-Date.* The paper consisted of an historical account of the development of the undergraduate course in education and the establishment of practice schools both in the United States and in foreign countries, with particular reference to France and Germany.

At the afternoon session Professor Frank E. Thompson of the University of Colorado discussed at considerable length the question of school observation and what it should seek to accomplish. In opposition to opinions expressed earlier in the meeting by some members, he supported the contention that observation and actual teaching should always go together. Nelther can accomplish its best results unless constantly tested by reference to the other. Especially does actual practice on the part of the student prevent too close imitation of the methods of the model teacher. It was suggested by Professor Thompson that the observer should always be required to prepare, before visiting the recitation, a plan for that particular lesson, correcting and amending it after the recitation by reference to the actual work of the expert teacher observed. In addition to this the observer should be required, after the recitation, to prepare a second lesson plan intended to accomplish the same results arrived at by the expert teacher in another and different way. It is more important according to this view for the observer to watch the children than to watch the teacher. The important questions for the observer should be: have the children aims in the recitation: do they realize their aims; and if so, how? Then, secondly, how does the teacher aid the children in those aims. After a number of observation lessons the student-teacher should make a careful analysis, first, of her own personality as compared with the personality of the teacher observed; second, of her own scholarship as adapted to the aims involved in the recitation; and third, of her own technique as compared with the technique of the expert. For such an analysis,

actual practice in connection with observation is absolutely essential.

At the evening meeting on Friday, two very interesting discussions were presented, one by Professor J. L. Meriam of the University of Missouri, giving an account of his experience in practice teaching at that institution, and second, a paper by Dean Fordyce setting forth the essential points in practice-teaching as his experience led him to see them. First of all in importance, according to Dean Fordyce, is the aim in the recitation on the part both of the teacher and of the pupil. This aim should be apparent to an observer without any previous knowledge of the plan actually prepared by the teacher. Second in importance is the character of the questions asked by the teacher. These should be such as to stimulate thought and lead the pupil beyond the book in his desire to understand the subject. Finally, emphasis was placed upon the fact that good methods are far more essential in high-school work than in the University or college, owing to the immaturity of the pupils. In the discussion of observation, Dean Fordyce called attention to the need of constant suggestions by the supervisor or expert observer. At first the new teacher does not see in the recitation the points which she ought to see, and it is largely through competent direction that this capability is acquired. Attention was also called to the fact that observation of a number of expert teachers is highly desirable in order to avoid too exact imitation of the methods of any one teacher.

By way of summary it may be said that the chief conclusion of the various discussions appeared to be that in the past too rigid adherence has been given to formal method to the detriment of the development of the personality of live teachers. This development may be promoted first by a study of live problems, and second, by means of actual practice and observation of good methods by prospective teachers. The importance of neither of these elements can be overestimated.

The conference was a most successful one, great interest being manifested in every meeting. This success was due in no small part to the informal nature of the discussions, questions and suggestions being constantly in order.

At the close of the session it was voted to thank Professor H. H. Foster for the great interest which he as first president of the organization had manifested in the arrangement of the program, and also to thank the authorities of the University of Nebraska for the use of its buildings and for its hospitable entertainment. The

next meeting will be held in December, 1913, at Omaha, Nebraska, the exact date to be arranged later. Dean Charles Fordyce of the University of Nebraska was elected President for the ensuing year.

C. H. WILLIAMS.

University of Colorado.

WHAT A STUDENT OF ELEMENTARY PSYCHOLOGY SHOULD BE TAUGHT CONCERNING THE FUNCTIONS OF THE NERVOUS SYSTEM.[1]

1. The enormous complexity of the neuro-musculo-glandular mechanism and process, homologus to the indescribably complex mental stream.
2. The utter inadequacy of central and axial localization to explain the actually experienced facts, mental or bodily.
3. That the nervous system functionally is a fabric with separate pathways of fibers only for anatomic safety, etc.
4. That the sole function of the nervous system, secondary phylenically to muscle, is to conduct impulses as the means to coördination.
5. The unified duality in the nervous system of vegetative (actuating, racial, autonomic, habitual, subconscious) and personal (inhibitory, individual, cortical, deliberate, new, and conscious).
6. The hierarchy of the nervous circuits, each including and more or less dominating those below it and influencing those above it.
7. The universality of cenesthetic influence into the central nervous system from the universally tonic or moving body, these influences of exciting energy constituting the reservoir from which all nerve-energy is drawn.
8. All possible detail that is agreed upon concerning the structure and action of the nervous system, and much more of the physiology of the effector mechanism than the average student learns.
9. That the nature of the nervous energy is still unknown (as is the nature of mental "energy"), and therefore that the purely metaphorical notion of "traces" in the nervous matter should be abandoned as misleading, a notion of sets of kinetic influences being substituted.
10. Above all, that it is better to know a few general trends or principles of action of the neuro-musculo-glandular fabric than to pretend an understanding not to be had from a relatively few unrelated, isolated, and uncertain facts of structure.

GEORGE V. N. DEARBORN.

Tufts Medical and Dental Schools.

[1]Author's abstract of a paper scheduled to be read at the Cleveland meeting of the American Psychological Association.

THE
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EDITORIALS.

THE SCHOOL PSYCHOLOGIST IN LONDON.

The creation of the post of "psychologist to the Education Department of the London County Council" deserves more than passing notice, because it is, we may hope, the entering wedge that will serve in time to introduce the practical psychologist into many other school systems, not only in England, but in other countries. For the present the London appointee, Mr. Cyril Burt, of the University of Liverpool, well known for his research in differential and correlational psychology, is to serve on half-time only, and his duties primarily concern the detection, examination and instruction of subnormal children—this because the present system of detection and examination by teachers and school physicians has proved so distinctly unsatisfactory that the appointment of a school psychologist was shown to be financially and administratively worth while. We hope that Mr. Burt's work will convince the educational authorities at London that a school psychologist can undertake with advantage to the schools a much wider field of investigation than that which is now assigned to him, and that eventually London will have the honor of establishing a real bureau of research in educational psychology.

G. M. W.

MENTAL NODES.

Are there such things as mental nodes,—critical or turning points in mental development? Does mental growth take place by mutations? Does the course of mental activity maintain the same level for a time until a certain head or pressure of potential energy has been accumulated, then suddenly surge to a higher level? Or does mental development take place smoothly and gradually by infinitesimal changes, no one of which can be detected separately, but which in the aggregate manifest increased efficiency? By analogy with biological processes recently brought to light the mutation theory might be expected to hold of mental development as well as of physical evolution.

The adolescent period has been hailed as such a critical turning point in mental growth, and we have a vast literature emphasizing the profound change in mental outlook which characterizes this age. The rapid changes in physical development at adolescence are said to have their mental counterpart in a complete disorganization of the old mental habits and attitudes, in an intensification of emotional tone, and in the development of new standards of judgment and reasoning. It is possible that this view is correct, and that adolescence involves the opening up of a new life, but in spite of the amount that has been written on the subject it must be admitted that we have very little accurate knowledge of the mental status of the adolescent. Most of the literature is highly imaginative, and is based either on reminiscences of the writer or on questionnaire data involving reminiscences of those who fill out the blanks. Actual studies of pre-adolescent, adolescent, and post-adolescent individuals, or of the same individuals throughout this whole period, are few and the results offer little evidence of cataclysmic mental change.

Now comes Professor Judd with the theory that the end of the fourth grade marks another mental node,—that the habits and modes of thought developed in infancy and early childhood here begin to break up and give way to a larger outlook upon life and a higher and more complex organization of experience. Evidence for this view is adduced from studies of retardation, of handwriting and of arithmetic. Whether there is any such general mental change at any particular period of life is an open question. At any rate we are in hearty sympathy with Professor Judd in the plea for more careful and extended studies of mental development in each of the elementary school subjects.

J. C. B.

NOTES AND NEWS.

In the issue of *Science* for December 20, 1912, Mr. William Kent, in the course of a discussion of "Academic Efficiency," suggests an educational experiment which should be given wide publicity in the hope of arousing discussion and perhaps inducing some man or group of men to undertake the investigation. The experiment would require ten years of time and perhaps half a million dollars, but, in view of the importance of the question, the amount would be well spent. The suggestion involves the appointment of a commission of five members, who would spend all of the first year investigating actual educational conditions in this country. They should then report on what should be the course of a boy between the ages of fourteen and eighteen (1) if he intends to go to work at eighteen, (2) if he intends to enter a general college, (3) if he intends to enter a technical school. "The second year the experiment is to be begun. Select a hundred boys who are ready to enter high school, of a majority of whom there is a reasonable probability that they will, if they prove fitted for it at eighteen, take a college course. Rent a preparatory school, or a portion of one, and have the boys taught, by selected teachers, in the courses laid down by the commission. Provide enough tutors or preceptors to insure that the education of the boys is properly supervised and that their time is not wasted. Continue their high-school education, for as many of them as stay in school, for four years. During all this time the commissioners are to be studying the methods of high-school teaching, and the methods of measuring the efficiency of teaching, preparing practical standards of examination, not merely to test the memory of scholars, as in ordinary examinations, but to test their mental and bodily powers. Find out not only what the boys know, as a mere act of memory, but what and how they think, and what they can actually do. Test not only the hundred boys, or as many of them as remain, but also boys in other high schools, by the same standards or by other standards that may be proposed by the high-school teachers. Cultivate the same spirit of emulation for success in scholarship that now exists

for success in the athletic field, but give them enough athletics and other recreation to develop their bodies as well as their minds. Train them also in hygiene, in morals and in manners, to make them not only scholars, but gentlemen.

"During these four years the commissioners are also studying college administration, courses, methods of teaching and efficiency, and determining standards of measuring efficiency. When the boys are through their preparatory course of four years, send them to such colleges as have been selected for them, have them take the courses for which they are fitted, provide tutors for them and watch their progress through the college, testing them by predetermined standards in comparison with other college students. At the end of the four-year college courses the commission is to report on the whole eight years' experiment. It will be found that many mistakes have been made, but probably not so many as would be made in an ordinary eight years' course of high school and college. The success of the experiment is not to be judged by the success of these selected boys, but by the value of the information obtained and reported on by the commissioners as to the various methods of teaching and of college administration and by the acquirement of standards by which academic efficiency may be measured in the future.

"During the whole of the eight years' experiment the boys should be required to keep a diary in which they record what seem to be the most important items concerning their education, and they should once a year present to the commissioners a written report of their progress, keeping a copy for their own future use. Four years after they have graduated from college, when their minds are sufficiently mature, they should be asked to write critical reports of their educational career as it then appears to them. A study of these reports by the commission, which should be continued in existence for that purpose, would no doubt furnish fruitful ideas for further educational progress."

In connection with the editorial in the January issue of this JOURNAL on the need for supervision of play and playground, it is interesting to note that the city of Philadelphia has absolutely refused to permit children to play save under supervision, and that the emphasis is laid on securing proper supervision of play rather than on large playgrounds or on complete equipment.

The New York Branch of the American Psychological Association held its regular monthly meetings on February 24. The address of the afternoon meeting was delivered by Prof. John B. Watson of Johns Hopkins University on "Psychology as the Behaviorist Views It." This is the first of a series of eight lectures on Animal Psychology to be delivered by Professor Watson as non-resident lecturer at Columbia University.

Professor Watson presented the view that psychology as the science of consciousness had not made good its claim as a natural science. As long as introspection is the method to be relied upon, there is bound to be disagreement as to results, and there can be no hope of settling the differences of opinion. If psychology is to achieve scientific results it must become objective. It must leave the question of consciousness to metaphysics and take as its field that of behavior. Behaviorism is the only consistent functionalism. As the science of behavior, psychology could establish its claim to be a science.

At the evening session at the American Museum of Natural History the following program was presented:

Mr. D. O. Lyon—Illusions and Hallucinations in Insanity.

Dr. F. Lyman Wells—A Note on the Retention of Practice.

Mr. C. M. Sax—Painting and the Learning Process.

Prof. C. C. Trowbridge—(1) Methods of Orientation and Imaginary Maps. (2) The Probable Explanation of Certain Flock Formations of Birds.

The editors and publishers of the Zeitschrift für pädagogische Psychologie und experimentelle Pädagogik have established a series of monographs entitled *Pädagogisch-Psychologisches Forschungen.* The object of this series is to present the results of experimental and statistical investigations in education which are too elaborate for publication as articles in the journal. The publications will deal with the anthropological and biological as well as the psychological aspects of paidology, and will include studies in the essentials of the teaching process. Numbers already announced are: N. Kraemer, *Experimentelle Untersuchungen zur Erkenntnis des Lernprozesses;* Fr. Müller, *Aesthetisches und ausseraesthetisches Urteilen des Kindes bei der Betrachtung von Bildwerken;* and G. Dehning, *Bilderunterricht.* The series is published by Quelle & Meyer, Leipzig.

Provision has been made by the school authorities of the city of Dresden, Germany, for experimental classes in elementary schools. These classes are to have the same number of pupils as the regular classes, but are to remain for three years under the same teacher. The widest latitude is allowed the teacher in the choice of course of study, materials and methods. This is an important step in the direction of the scientific study of school practices, and is to be commended to the consideration of progressive American superintendents.

The city of Hamburg has opened an institute for experimental psychology and pedagogy under the direction of Prof. E. Meumann. The institute is comfortably housed in a large twelve-room building, and in addition to the laboratory rooms will contain a library and a psycho-pedagogical museum, in which visitors may themselves try typical experiments as described in printed directions. Professor Meumann is also perfecting the plans for an International Institute of Paidology in Hamburg.

Prof. Clayton C. Kohl has resumed his work in the Department of Education at Mount Holyoke College after a sojourn of several months in Germany. Professor Kohl paid special attention while in Europe to instruction in elementary schools and to the professional activities of the various teachers' societies, especially of the *Lehrerverein* at Leipzig.

At the annual public meeting of the Women's Club of Buffalo, N. Y., on the 10th of February, Professor Whipple of Cornell University delivered an address upon "The Problem of the Subnormal and of the Supernormal Child."

W. S. Learned, Ph.D. (Harvard), is conducting a series of psychological and pedagogical investigations in the public schools of Newton, Mass. Among the researches under way are the amplification of the Courtis arithmetic tests, the trial of the Hillegas tests of English composition, the feasibility of bridging the gap between the elementary and the secondary school, and an analysis of mental, social and moral traits that will assist teachers in the characterization and understanding of individual pupils. The initiation of this type of work adds one more feather in the cap of Superintendent Spaulding.

who already has the reputation of administering one of the finest school systems in the United States.

Addresses were recently delivered before the Brooklyn Training School for Teachers by Prof. Lightner Witmer of the University of Pennsylvania on "The Treatment of Gifted Children in the Schools," and on "The Montessori System," and by Dr. Walter E. Fernald, superintendent of the Massachusetts School for the Feeble-Minded, on "Sense Training and Motor Training in the Education of Young Children."

CURRENT PERIODICALS.

(In this section only such articles will be noticed as bear directly or indirectly upon the interests of this Journal.)

SCHOOL REVIEW. Vol. XXI, No. 1, January, 1913. JAMES ROWLAND ANGELL. *The Duplication of School Work by the College.* 1-10. A preliminary paper on the relations between the high school and the college. The college should be extremely careful in its elementary courses not to try to do over again the work that could and should be done by the high school.

CHARLES H. JUDD. *The Meaning of Secondary Education.* 11-25. The author points out the duplication and waste in the articulation of elementary and high schools, and shows the deadening effect of this thoughtless repetition upon the interest of the pupils.

WILLIAM R. PRINCE. *The Second Year of a Modern Language.* 26-38. A stimulating discussion of devices for energizing the linguistic life of the pupil in connection with modern language work.

FRANKLIN W. JOHNSON. *The Hillegas-Thorndike Scale for Measurement of Quality in English Composition by Young people.* 30-49. A trial of the scale with actual compositions of young people reveals several defects: (1) There is wide variation in the ranking given to individual specimens by different judges; (2) the specimens of the scale give no evidence of originality of thought. They are, therefore, not representative; (3) form and thought content should be estimated separately.

TEACHERS' COLLEGE RECORD. Vol. XIII, No. 4, September, 1912. MILO B. HILLEGAS. *A Scale for the Measurement of Quality in English Composition by Young People.* Pp. 54. Contains a complete description of the methods used in deriving the scale, the scale itself, and a discussion of the qualifications of the judges on whose estimates the scale was constructed.

No. 5, November, 1912. DAVID EUGENE SMITH, and others. *Number Games and Number Rhymes.* Pp. 111. The most complete and elaborate attempt yet made to enable the teacher to take full advantage of the play spirit in the work in mathematics. Every teacher of mathematics will find it a valuable resource.

ZEITSCHRIFT FUER PAEDAGOGISCHE PSYCHOLOGIE UND EXPERIMENTELLE PAEDAGOGIK. Vol. XIII, No. 10.

MORITZ SCHEINERT. *On the Maintenance of Discipline.—A Contribution to the Psychology of the Teaching Profession.* 500-507. A psychological analysis of the relations between teacher and pupils which make for or against good discipline.

ALOYS FISCHER. *Concerning Laziness,—A Psychological Analysis.* 507-516, 545-561. The summary treatment of laziness as a pathological phenomenon is too easy a disposition of the problem, and does violence to the common significance of the term. The author defines it as a habitual weakness of voluntary attention, and distinguishes two types, one in which the movement of attention is dull, heavy and obstructed, the other in which there is an extreme instability of attention. While native constitution may predispose to one or the other type, the author lays emphasis on the habitual character of the defect, and finds its treatment in the establishment of corrective habits.

E. MEUMANN AND R. H. GOLDSCHMIDT. *Suggestions for Practical Investigations in Paidology and Experimental Pedagogy.* 516-521. The outline of a program for the extension and popularizing of experimental and statistical studies of children.

MAX BRAHN. *The Psychology of a Mathematical Prodigy.* 529-533. Calls attention to the detailed study of the memory of a distinguished mathematician to be found in G. E. Müller's *"Zur Analyse der Gedächtnistätigkeit und des Vorstellungsverlaufs."*

No. 11. MAX HENTSCHEL. *Memory Span.* 562-579. Tests of school children with series of consonants indicate that weak intelligence is always accompanied by short memory span. The author finds this relation so constant that he considers it one of the most important tests of intelligence. The differences in memory span among school children are so pronounced as to call for a differentiation of courses of study to take account of individual characteristics.

H. W. WITTHOEFT. *A Preliminary Statistical Study of the School Records of Elementary Pupils.* 597-623. An elaborate study of the record books of 96 Hamburg *"Volksschule"* pupils that left school during the year 1910 leads to a severe criticism of the course of study.

ERNST MEUMANN. *Suggestions for Practical Investigations in Paidology and Experimental Pedagogy. A. Problems Connected with Tests of Intelligence.* 623-638. A historical discussion of the Binet tests and a brief mention of some of the criticisms and suggested modifications which they have received.

PUBLICATIONS RECEIVED.

(Notice in this section does not preclude a more extended review.)

ETIENNE BURNET. *Microbes and Toxins.* New York: G. P. Putnam's Sons, 1912. Pp. xvi, 316. $2 net.

With the marvelous advances that are now being made in the control of typhoid fever and other noxious diseases by serum inoculation there comes a demand from the intelligent public to know more about the nature of these infections and modern methods of combating them. The present book, written by a member of the Pasteur Institute, in Paris, presents the latest discoveries of science in a simple and readable form. As knowledge is the foundation of hygiene, this book should be widely read and thoughtfully digested.

MABEL CARNEY. *Country Life and the Country School.* Chicago: Row, Peterson & Co., 1912. Pp. xii, 405.

This is one of the many books dealing with the vital educational problem which centers in the conservation and improvement of the ideals of rural life. The aid that it offers to the country teacher is general rather than specific, sociological rather than pedagogical. The various chapters discuss such problems as the farm home, the country church, the grange, good roads, the rural school as a social center, consolidation of rural schools, school sanitation and decoration, boys' and girls' clubs, and the like.

MAXIMILIAN P. E. GROSZMANN. *The Study of Individual Children.* Plainfield, N. J.: National Association for the Study and Education of Exceptional Children, 1912. Pp. 74.

As the sub-title tells us, this little book presents a system of records, including a complete child history, medical examinations, physio-psychological and mental tests, daily regimen and disease record. There is no doubt that more detailed child histories are greatly needed, and the questions of the present list cover almost every phase of the child's antecedents and behavior. Whether anyone but a medical man would be apt to answer them is a subject for debate. The author rejects the Binet classification of mental tests by years on the ground that no hard and fast line can be drawn between what is characteristic of one or the other chronological year of a

child's life, and adopts a classification by periods—primary, elementary, intermediate, and advanced. The tests for these periods involve much new material, including graded tests for musical ability.

W. H. Heck. *A Study of Mental Fatigue in Relation to the Daily School Program.* Lynchburg, Va.: J. P. Bell Company, 1912. Pp. 28.

The report of an experiment conducted in four New York City schools to discover the changes in efficiency manifested by pupils during a school day. As a measure of the efficiency a modification of test number seven of the Courtis Standard Tests in Arithmetic was used. The results warrant the conclusion that mental fatigue is a negligible quantity in school management, provided the children are working under proper hygienic conditions.

Arthur Holmes. *The Conservation of the Child.* Philadelphia: J. B. Lippincott Company, 1912. Pp. 345. $1.25 net.

The author, who was formerly assistant director of the psychological clinic in the University of Pennsylvania, "aims to give a practical description of the inauguration and operation of a psychological clinic." The chapters treat of the constitution, function, field and operation of the psychological clinic, the methods of classifying clinic cases, the classification of moral deviates, and the sociological relations of the clinic. The work is unquestionably the most complete and authoritative account of the psychological clinic yet published.

Harriet E. Hunt. *The Psychology of Auto-Education.* Syracuse, N. Y.: C. W. Bardeen, 1912. Pp. 82.

An attempt to connect the practice of Madam Montessori with the philosophy of Henri Bergson, as expressed in his *Creative Evolution.* Chapter I discusses auto-education from the Montessori point of view, chapter II analyzes the content of knowledge according to Bergson, chapter III considers learning and teaching from the point of view of establishing relations, and chapter IV sketches a public school system organized in accordance with the views already set forth.

Vernon L. Kellogg. *Beyond War. A Chapter in the Natural History of Man.* New York: Henry Holt & Co., 1912. Pp. x, 172. $1 net.

This delightful little book traces the natural history of man through the early geologic ages, from the time of the Great Ice, where, as an animal, he lived by his kill; through the vicissitudes of cave

life, where he combined with others to fight against groups of his own kind; through the ages of copper and bronze and iron to the highly diversified creatures of historic times. Looking at the future in the light of this long past, there is every encouragement to believe that man is rapidly becoming too rational to tolerate the waste of war.

PAUL KLAPPER. *Principles of Educational Practice.* New York: D. Appleton & Co., 1912. Pp. 425.

This is a meaty book which gives evidence of wide reading, thoughtful reflection, and ingenious focussing of data from varied fields upon the problems of educational procedure. The main topics are conventional enough,—"Education as Physiological Adjustment, as Sociological Adjustment, and as Mental Adjustment,"—but the treatment of these is in many respects original and stimulating. In his psychology the author does not stray far from James, but the wealth of detailed application to school situations makes this a book to be reckoned with by the educational psychologist.

HUGO MUENSTERBERG. *Psychologie und Wirtschaftsleben, ein Beitrag zur angewandten Experimental-Psychologie.* Leipzig: J. A. Barth, 1912. Pp. viii, 192. M. 2.80. Geb. M. 3.50.

The first serious, systematic attempt to apply the methods of experimental psychology to the problems of vocational life and to the task of selecting for a given piece of work the individuals who by nature and training are best fitted for it. The four main heads of the discussion are: I. Preliminary Questions; II. The Selection of Fitting Individuals; III. The Attainment of the Best Possible Results; and IV. Eliciting the Desired Mental Attitudes. An important contribution to applied psychology.

SAMUEL CHESTER PARKER. *A Text-Book in the History of Modern Elementary Education.* Boston: Ginn & Co., 1912. Pp. xxvi, 505.

A well written, well organized, and well illustrated book, marking in all probability a new era in the construction of texts in the field of educational history. The author has followed the principles, so successfully developed in the making of recent text-books in general history, of (1) intensive treatment of a limited field, (2) emphasis on a relatively few selected movements which are typical, (3) discussion of the chosen topics in such a concrete way as to help the student to appreciate the reality of the historical development.

WILLIAM LYON PHELPS. *Teaching in School and College.* New York: The Macmillan Company, 1912. Pp. xii, 186. $1 net.

A frank, genial, entertaining series of chats on the teaching of English literature. The author draws from a rich store of experience,

and makes many good, sensible suggestions. A more extended appreciation of the book from the standpoint of the experimental educationalist will be found in this JOURNAL, Vol. III, p. 584.

ROBERT R. RUSK. *Introduction to Experimental Education.* New York: Longmans, Green & Co., 1912. Pp. viii, 303. $1.40 net.

This is a book which has been much needed in English. Based on Meumann's *Vorlesungen zur Einführung in die experimentelle Pädagogik,* it condenses that writer's lengthy discussions into a brief compass, and focusses attention upon the work of English and American investigators in this field. We bespeak for the book a wide adoption as a text in college classes in education.

BERNHARD SCHULZ. *Psychologische Wanderungen auf Seitenwegen.* Jena: Gustav Fischer, 1913. Pp. viii, 242. M. 8.00.

In these essays on psychological subjects by an eminent physician there is a staunch advocacy of the point of view of the behaviorist. Neither interaction nor psychophysical parallelism is adaquate to account for all of the facts, but both the mental and the physical must be viewed as a unity in the behavior of the living organism.

R. SCHULZE. *Experimental Psychology and Pedagogy.* Translated by Rudolf Pintner. New York: The Macmillan Company, 1912. Pp. 365.

This book, which is extensively used by teachers in Germany, is well adapted for supplementary reading in educational psychology. It is an attempt to illustrate the various methods of experimental procedure in psychology with reference to educational aspects. There are no less than 314 illustrations. These include a rather complete series of ordinary psychological instruments. There are, for example, several illustrations of chronoscopes, many ergographs, and a variety of forms of memory apparatus. This makes interesting reading to the person who knows the psychological laboratory, but will probably be rather difficult for others to interpret. The material is classified on the basis of the Wundtian psychology. The author has drawn mainly from German sources.

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THE JOURNAL OF
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THE WHOLE AND PART MEHODS OF MEMORIZING POETRY AND PROSE.

MARY E. LAKENAN,
University of Colorado.

Undoubtedly few psychological problems are of greater practical educational value than those which deal with effective means of learning. If we can find by experiment how material should be presented, so as to be the most readily learned and permanently retained, the knowledge should be of value to every student. Perhaps one of the most practical problems connected with this matter of effectual presentation of material to the learner is that of the relative values of the part and whole methods of memorizing such material as would ordinarily be used in school work or in daily life. The part method is used by the majority of students, and consists in dividing the material to be learned into a number of parts which are learned separately, and finally connected. The whole method consists in going over and over the entire selection from beginning to end until it is mastered.

Stefféns,[1] Pentschew,[2] des Bancels,[3] and Pyle and Snyder,[4] have tested the comparative values of the part and whole

[1]STEFFENS, LAURA. *Beiträge zur Lehre vom ökonomischen Lernen.* Zeits. f. Psy. u. Physiol. d. Sinn. Vol. 22, pp. 321-382.

[2]PENTSCHEW, C. *Untersuchungen zur Ockonomie and Technik des Lernens.* Arch. f. d. ges. Psy., 1903. Vol. I., pp. 417-526.

[3]LARGUIER DES BANCELS, *Sur les Methodes de Memorisation.* L'Année Psychologique. Vol. VI, pp. 185-ff.

[4]PYLE, W. H., AND SNYDER, J. C. *The Most Economical Unit for Committing to Memory.* Journal of Educational Psychology, Vol. II, pp. 133-142.

methods of learning selections of poetry, varying in length from 8 to 240 lines.

In general, they have found the whole method of advantage, both for first learning, and for retention, but as many of their results are based on a very small number of cases, their validity cannot be regarded as absolute unless verified by further experiments.

The object of the series of experiments described in the following pages is first, to verify, if possible, the results of the investigations just mentioned for learning poetry by the part and whole methods, and second, to test the relative values of these methods for memorizing prose, which heretofore has not been used as material in tests of this kind.

The work was done at the University of Colorado, during the years of 1909, and 1910, under the supervision of Dr. V. A. C. Henmon, to whom I am deeply indebted for his selection of the problem, for his active interest and encouragement in the work, and for his helpful criticism and suggestions as to arrangements of results.

The writer, (L), was the subject in most of the tests, only one other subject, (W), also a University student, having taken part in the work. In Experiment I, A and B, selections of poetry varying in length from 9 to 36 lines were learned. In Experiment II, prose selections 100, 200, and 300 words in length were learned.

In most of the experiments, the number of repetitions required for learning is the only measure of economy for first learning, the time factor having been found to be variable, owing to the difficulty of preserving a uniform rate of reading for the two methods. Retention was measured by relearning the material after a given interval, calculating in terms of percentage the saving *for each method,* and taking the *difference* between them, which is given in the tables as the measure of retention.

The term "repetition" is used in this paper to denote the first reading of material as well as the following ones:

TABLE I.

EXPERIMENT I. COMPARISON OF PART AND WHOLE METHODS FOR LEARNING POETRY.

A.

SUBJECT W.						SUBJECT L.					
SAVING IN FIRST LEARNING.											
No. of lines.	Rep.	Time.	Method of Advantage.	% of Adv. Rep.	% of Adv. Time.	No. of lines.	Rep.	Time.	Method of Advantage.	% of Adv. Rep.	% of Adv. Time.
9	1.	23.2	Part	8%	6%	9	2.7	27	Part	16%	6%
18	1.2	64.4	Whole	8%	7%	18	1.0	146	Part	5%	16%
27	1.4	142.0	Whole	8%	9%	27	4.7	340	Part	20%	24%
DIFFERENCE BETWEEN PERCENTAGES OF SAVING IN SECOND LEARNING (AFTER 24 HOURS).											
9	7%	3%	Part			9	0%	1%	Whole		
18	3%	6%	Whole			18	3%	2%	Part		
27	4%	2%	Whole			27	6%	6%	Whole		
DIFFERENCE BETWEEN PERCENTAGES OF SAVING IN THIRD LEARNING (AFTER ONE YEAR.)											
						9	5%		Whole		
						18	14%		Whole		
						27	19%		Whole		

B.

SAVING IN FIRST LEARNING.			
9	.71	Whole	8%
18	1.52	Whole	16%
27	2.33	Whole	23%
36	2.91	Whole	32%
DIFFERENCE BETWEEN PERCENTAGES OF SAVING IN SECOND LEARNING (AFTER 2 TO 7 MONTHS.)			
9	12%	Whole	
18	10%	Whole	
27	18%	Whole	
36	22%	Whole	

EXPERIMENT I. COMPARISON OF THE PART AND WHOLE METHODS OF LEARNING POETRY.

A.

Both subjects, W. and L., took part in this experiment, which continued from February tenth to May tenth, 1909. The material consisted of entirely unfamiliar stanzas from Byron's "Childe Harold." These were studied until they could be repeated once without error. After twenty-four hours

they were learned a second time, and in the case of L, thirty-two passages were learned a third time after an interval of one year. Each subject learned twenty nine-line, ten eighteen-line, and five twenty-seven-line selections by the part method, and an equal number by the whole method. The learner in each case read aloud the passage to be memorized, and the experimenter kept an exact record of the time and the number of repetitions required to learn it.

Table I A. Shows the result of this experiment, giving for first learning the number of lines in the selections learned, the average saving in repetitions, the average saving in seconds, the method of advantage and the amount of that advantage in terms of percentage. For the second and third learnings, only the difference between the percentage of saving by the two methods is given.

It will be noted that in the case of W., the part method proved of advantage for the first learning of 9-line selections, and also for retention. 18 and 27-line selections, however, were more readily learned, and also better retained when the whole method was employed.

In the case of L. the part method proved of advantage for first learning in every case, both as regards time, and the number of repetitions required for learning. Retention after 24 hours was better when the whole method was used, for 9 and 27 lines, but was better when the Part Method was employed, for 18 lines.

Retention after an interval of one year, however, proved to be decidedly better for the stanzas learned by the *Whole* Method. It will be remembered that in every case the part Method was of advantage in learning these selections the first time, so these results would indicate that when firmness of retention is desired, the whole method should be used, even though the learner may be able to master the material at first with less effort by means of the part method. It also appears that the whole method is of increasing value, as regards retention, as the length of the selection to be learned is increased.

B.

The results obtained in the experiments just described were not regarded as entirely satisfactory, because the subjects were entirely unaccustomed to memorizing; the time of day at which the work was done was not one at which the mental faculties seemed most alert; the place in which the work was done was not entirely free from interruptions, and the feeling of being watched and timed proved very distracting to both subjects. L. especially was in a state of constant muscular strain, caused by the anxiety to learn quickly, and the annoyance occasioned by forgetting. After some months of practice in memorizing, therefore, eighty additional passages from the same poem were learned by L., and relearned after an interval of seven months for most of the material, but two months for a small part of it. In addition to nine, eighteen, and twenty-seven-line selections thiry-six-line selections were also learned.

The work was done at the same hour every day—from six to seven A. M., under conditions of absolute quiet. Only the number of repetitions required for learning were noted, and the recording of these was done by the subject herself. When the whole method was used, a mark was made on paper for every entire repetition of the material; when the part method was used, a pencil stroke was made every time a single line was read, the total number being divided by the number of lines in the selection to obtain the number of repetitions of the whole piece. This method of recording soon becomes purely mechanical, and does not distract the attention at all from the process of learning.

No comparison of the results of this experiment was made until the entire series of selections was learned, for fear that the knowledge of which method was proving most economical might affect the results.

The results of this series of tests (Section B, Table I) show a decided advantage for the whole method, both as regards first learning, and relearning, an advantage which, with only one exception, increases as the length of the selection to be learned is increased.

As already stated, the conditions under which this part of

the work was performed were much more satisfactory than those of the earlier work, and for this reason the latter results should be considered more trustworthy than the earlier ones. Of special significance is the fact that practice in memorizing for a subject who at first found the part method of marked advantage resulted in a decided saving in the side of the whole method.

TABLE II.

EXPERIMENT II. COMPARISON OF THE PART AND WHOLE METHODS FOR LEARNING PROSE.

SAVING IN FIRST LEARNING.

No. of Words.	Rep.	Method of Advantage.	Percentage of Advantage.
100	0.17	Whole	2%
200	1.26	Whole	16%
300	2.23	Whole	30%

DIFFERENCE BETWEEN PERCENTAGE OF SAVING IN SECOND LEARNING (AFTER 24 HOURS).

100	5%	Part
200	3%	Whole
300	13%	Part

DIFFERENCE BETWEEN PERCENTAGES OF SAVING IN THIRD LEARNING (AFTER 2 TO 7 MONTHS).

100	9%	Whole
200	6%	Whole
300	18%	Whole

EXPERIMENT II. A COMPARISON OF THE PART AND WHOLE METHODS FOR MEMORIZING PROSE.

The material for this test consisted of one hundred and twenty prose selections from the essays of Mathew Arnold and Thomas Huxley, carefully standardized, by cutting out unessential words, or adding significant ones, so they contained exactly one hundred, two hundred, or three hundred words each. Twenty selections of each length were learned by the whole and an equal number by the part method.

One subject, L., took part in this experiment which was conducted from six to seven o'clock A. M. every day from June 20 to August 20, 1910. The part and whole methods were either employed alternately on the same day, or on alternate days. Half of the selections were re-learned after

twenty-four hours, and the other half were re-learned after seven months. To avoid the possibility of the practice effect falling on any one part of the material, the following order of learning was followed: First, half of the one-hundred word passages were learned, then half of the two-hundred word passages, then all of the three-hundred word passages, then the remainder of the two-hundred word, and finally the remainder of the one-hundred word passages.

The method of recording the repetitions by the part method was as follows: The selection to be learned was divided into sentences, and the number of words in each sentence was noted, then the sentences were numbered, 1, 2, 3, etc. When any sentence was read, a pencil stroke was made opposite the corresponding number. Thus the total number of words repeated was easily calculated, and when divided by the number of words in the whole selection, gave the number of repetitions for that selection.

From Table II it will be noted that in first learning the whole method proved to be of advantage in every case, with a steady rise in the saving, as the length of selections was increased.

Relearning after 24 hours showed the saving to be in favor of the *part* method for 100 and 300 word selections, and in favor of the whole method for 200 word selections.

Relearning after an interval of several months showed in every case a greater saving for the whole method than for the part method. The results of this test thus appear to indicate that retention cannot be adequately measured by relearning in twenty-four hours.

Contrary to common belief, prose proved to be more readily learned than poetry. Poetry, however, was better retained.

Perhaps attention should be called at this point to an interesting coincidental result which appeared in experiments I (B) and II, in the relation of the number of repetitions required for learning, to the length of the selection learned. For learning poetry this relation is as follows:

9 lines,		18 lines,		27 lines,		36 lines,	
Whole	Part	Whole	Part	Whole	Part	Whole	Part
8.3	9.01	9.3	10.82	10.0	12.35	*9.1*	*12.01*

This shows an increase in the required number of repetitions, as the length of the selection is increased, until it reaches 36 lines, when there is a decrease, in the case of both methods, in the number of repetitions required for learning, so that fewer repetitions are required for learning 36 lines, than were required for learning 27 lines.

That the above result is not merely an accidental variation, is indicated by the fact that the same relation was noted in the learning of the prose selections. It will be remembered that especial care was taken in the arrangemnt of the material, in order that the practice effect might not fall on the three-hundred word passages. The relation is as follows:

100 words		200 words		300 words	
Whole	Part	Whole	Part	Whole	Part
9.6	9.23	8.3	9.56	7.7	10.6

Here there is, for the whole method, a steady *decrease* in the number of repetitions required for learning, with *increase* in the length of the selection to be learned, while the reverse is true of the Part Method.

EXPERIMENT III. A COMPARISON OF THE WHOLE AND PART METHODS OF MEMORIZING PROSE FOR CHILDREN.

Five girls and two boys in the seventh grade were the subjects in this experiment. The material to be learned consisted of ten of Aesop's Fables, reduced to one hundred words each, five selections being learned by each method. Care was taken to choose fables which were unfamiliar to the children, any one which was recognized by any child as having been read before was laid aside, and another substituted in its place.

The children were told to learn the fables as quickly as possible and an exact record was kept of the number of repetitions required to learn the piece. Only one child seemed distracted by the presence of the experimenter and the feeling that he was being watched. All of the subjects were volunteers and all seemed to enjoy the work. After twenty-four hours the fables were relearned.

In five cases out of seven, there was a saving in favor of the whole method for first learning, this saving varying from

0.46 of a repetition to 2.96 repetitions. For retention, after 24 hours, the whole method proved of advantage in four cases out of seven.

GENERAL CONCLUSIONS.

From a consideration of the results obtained during the course of experiments described in this paper, the following general conclusions may be drawn:

(1) For memorizing poetry, the whole method is, in general, more economical than the part method. In cases where the part method was of advantage for first learning, the percentage retained after a number of months was greater for material learned by the whole method than for that learned by the part method.

Training on the part of a subject who at first obtained better results by using the *part* method, resulted in a decided saving on the part of the *whole* method, showing that the whole method of learning gains more in efficiency from practice than does the part method.

(2) Prose is more readily learned and better retained by means of the whole method than by the part.

(3) For both poetry and prose there is an increase in effectiveness of the whole method with increase in the length of the selection to be learned, up to 36 lines of poetry and 300 words of prose, which were the limits of the experiments.

(4) Retention does not appear to be adequately tested by relearning after twenty-four hours. Results thus obtained are often reversed by relearning again after several months.

(5) Prose is more readily learned than poetry, but poetry is better retained than prose.

(6) In learning prose by the whole method, fewer repetitions are required for learning a 300-word selection than for learning a 100 or 200-word selection, while in learning prose by the part method, there is a slight increase in the number of repetitions required, with increase in the length of selection to be learned.

In memorizing poetry, 36 lines require fewer repetitions for learning than do 18 lines, when the whole method is used. When the part method is used, there is an increase in the number of repetitions required for learning with increase in

the length of the selections to be learned, with one exception —36 lines require fewer repetitions than do 27 lines.

(7) Most of the children tested found the whole method of advantage for first learning.

Thus these tests have verified the results of former investigations in regard to the value of the whole method of learning poetry and have further demonstrated the value of the whole method for learning prose.

THE SLEEP OF SCHOOL CHILDREN, ITS DISTRIBUTION ACCORDING TO AGE, AND ITS RELATION TO PHYSICAL AND MENTAL EFFICIENCY.

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PART II. THE RELATION OF SLEEP TO INTELLIGENCE, TO SCHOOL SUCCESS AND TO NERVOUS TRAITS.

In order to obtain further information about the relation of sleep to the child's home conditions, his school success, intelligence, nervous traits and physical defects, a supplementary blank was filled out by the teacher for each child. This, of course, was done without the child's knowledge. The grades actually received by the child in a quarter of a semester were recorded, and the descriptive term underscored. The blank used was of this form:

Name..... Age..... Grade.....

Grades for semester or quarter:

Arithmetic	Geography	Writing
Language or Grammar	Nature Study	Music
	Physiology or Hygiene	Deportment
Reading		Application
Spelling	Manual Training	
History	Drawing	

The following to be filled by the teacher. (Absolutely confidential.)

1. Culture of home if known. (Underscore appropriate word) Excellent, average, low, very low.
2. Child's intelligence. (Underscore appropriate word) Genius, excellent, good, fair, dull, very dull, feeble-minded.
3. Underscore any of the following words which designate traits of this child: Lazy, slovenly, bad-tempered, obstinate, complaining, irritable, quarrelsome, laugh or cries without cause, stutters, disobedient, lacks self-control, fidgety.

Supplementary records were obtained for 1350 pupils varying in age from six to sixteen years. From these records, the correlation between the amount of sleep which the children receive and their school success has been computed. Also the correlation between the number of "nervous" traits of the

child and sleep, and the correlation between sleep and the social status of the home and with intelligence has been computed. The method used was the well-known "product moment" formula of Karl Pearson.

The results were wholly unexpected. *In every case it was found that there was practically no correlation, either positive or negative. This was true for every school subject and for every age.* The instances in which the coefficient exceeded either plus .10 or minus .10 were so few and appeared so sporadically as to appear to be wholly without significance.

(a) TABLE OF CORRELATION VALUES

Ages 6 to 10.

	6	7	8	9	10
Nervous Traits.....	.014	—.074	—.0348	—.055	—.0403
Intelligence	—.016	—.095	—.048	.087	—.041
Social Status.....	.0106	.00092	.073	.024	—.066
Arithmetic	.011	—.042	.044	.022	—.47
Language	—.11	—.39	—.0122	.0619	—.023
Spelling		.0066	—.034	—.084	.021
Reading	—.11	.12	.0304	.077	.25
History				—.36	—.0052
Geography			.63	.078	—.093
Nature Study.....				—.062	.038
Physiology					—.36
Manual Training....				.091	—.25
Writing	—.011	—.0509	—.106	.1005	.0016
Music		—.802	.00309	.031	.055
Deportment	.013	.0709	.108	—.091	.098
Application	.016	.032	—.000082	.15	.109
Drawing		.104	—.259	.19	—.14

(b) TABLE OF CORRELATION VALUES.

Ages 11 to 16.

	11	12	13	14	15	16
Nervous Traits	—.0047	—.00072	—.067	—.0601	.302	.25
Intelligence ...	—.0503	—.0015	—.13	—.061	—.0043	—.081
Social Status..	.054	.037	.0089	.207	—.39	—.24
Arithmetic	—.0048	.00409	.026	.0087	—.17	—.074
Language	.051	.00078	.96	—.138	—.15	—.17
Reading	—.099	.0025	.099	—.505	—.27	—.062
Spelling	.045	—.022	.045	.044	—.0509	.11
History	.23	.017	—.00026	—.202	.11	—.49
Geography	.101	.013	—.0051	—.41	.0701	.0076
Nature Study..	.05	.0061	.037	.801	.319	.095
Physiology ...	.036	.053	.78	—.34	.18	
Manual Train'g	.46	—.0016	—.118	.16	.036	—.11
Writing	.16	.016	.011	—.033	—.14	—.37
Music	.078	.033	—.15	—.0051	—.49	—.29
Deportment ..	.16	—.016	—.086	.061	.12	—.11
Application ...	.064	.0072	.076	.049	.087	.011
Drawing	.31	.014	.051	.0081	—.025	—.15

How are we to interpret a result so at variance with the opinions usually expressed by physicians and hygienists? For a generation writers and teachers of child hygiene have constantly directed the attention of the home to the danger of too little sleep for children of school age. Over and over has the class-room teacher been warned that the irritable or incorrigible or backward child is likely to be suffering principally from deficiency of sleep and rest.

One interpretation of our data would be that the average child actually receives more sleep than he needs, that mind and body reach their highest efficiency with a definite, as yet undetermined, minimum of sleep. This explanation receives some support in the fact that for each age *the school grades of the ten pupils receiving the smallest amount of sleep did not rank below the grades of the average sleeper, but instead slightly above.* If they with a far less amount of sleep than the average children secured could reach even a higher standard of efficiency wherein has the excessive sleep of the majority functioned? Does it give a reserve of energy which is not ordinarily drawn upon but which may be serviceable in extreme emergencies, or does it represent a waste of time? This is a question of far-reaching importance for the biologist and hygienist to answer.

Certain experimental studies tend to support the theory that the customary amount of sleep is greater than is necessary. It has been well established by several investigations that the maximum depth of sleep is usually attained in from one to two hours, after which sleep rapidly though somewhat irregularly becomes more superficial until wakefulness ensues. The last third of the usual sleep period, especially, is disturbed by the occurrence of dreams, and, because of its lack of profundity may be of inferior value in its restorative effect. It has been suggested that this period of less effective sleep might be considerably shortened without material loss.

Weygandt, for example, carried out a long series of experiments upon himself to discover the rate at which recovery from fatigue proceeds at different parts of the sleep period (40).[1] By means of the "addition method" and "memory

[1]The bibliography for the entire series will be found at the end of Part III.

method'' he compared his mental efficiency just before retiring at 11 o'clock P. M. with his efficiency after sleep periods of varying length. Each test was of a half hour's duration. The first was taken immediately before retiring, the second after one-half hour or more of sleep, and the third in the morning after spontaneously awakening from as extended sleep as he desired. This was done every second night. Strange to say it was found that the middle test, the one taken after one to three or four hours of sleep, gave, as a rule, slightly better results than the morning test, and very much better results than the evening test. The curve of efficiency during the evening test always fell rapidly as the test proceeded and was very low at the end of half hour. This, of course, is an indication of extreme fatigue. But in both night and morning tests the curve of efficiency *rose* steadily throughout the half-hour. For addition it was found that the night curve was just as good after an hour of sleep as after five hours or more. For memorization, however, five hours of sleep were necessary in order to make the night performance as good as that of the morning. Even this is some three hours less than the accepted standard for the sleep of adults. Weygandt concludes from his experiments that the recuperative power of sleep is roughly proportional to its depth, and that the morning period of superficial sleep is of relatively slight value.

But we should hardly be warranted in concluding from this experiment that sleep could be *permanently* reduced to two or three hours per night without affecting the capacity for work. The observations of Netschajeff (27) are in point here. This author kept very exact records of his working ability every day for four months and correlated his results with the varying amount of sleep and exercise. His tables and curves seem to show that even the slight increase of sleep from 54 to 56 hours per week resulted in an increased mental efficiency of nearly 14 per cent. At the same time, Netschajeff found no relation between sleep and mental ability *when only a single day was taken into consideration.* The margin of safety is such that the loss of one entire night of sleep affects but little the work of the succeeding day, but complete deprivation from sleep for several days in succession is known to produce death. The human body can survive starvation

for more than six weeks. There is no authentic record that it has ever survived six days of utter sleeplessness.

The well-known experiments of Gilbert and Patrick, who with one other subject remained awake for 90 hours and made during this time numerous observations and tests of their physical and mental condition (29), showed that profound disturbances of memory, attention, etc., did not appear until the second and third day. Before the close of the experiment, however, mental ability had so much deteriorated that one of the subjects was unable to commit to memory in 20 minutes a passage that would normally have required not more than two minutes. The onset of hallucinations during the last day and a threatening drop of three degrees in body temperature in one of the subjects brought this interesting experiment to a close at the end of ninety hours. The subjects went to bed and slept soundly. They awoke feeling perfectly refreshed, and during the nights immediately following slept but little more than the regular amount. Altogether, they made up only 16 to 35 per cent. of the sleep they had lost.

What is the meaning of this failure to make up the entire loss of sleep? It would seem to signify one of two things: either that (1) some portion of the eight hours of sleep usually taken is superfluous, or (2) these subjects had unconsciously secured a certain amount of recuperation (sleep?) during the ninety hours by virtue of a lowered intensity of mental activity. There may be some truth in this former theory, but there is probably more in the latter. That is, the mind deprived of sleep revenges itself by inconsequential dawdling during the hours of work. It secures by stealth what is denied it as a right. Throughout the animal kingdom, wakefulness (awareness) is in inverse proportion to the depth of the sleep with which it habitually alternates. Animals of low order in which sleep is little marked display only the most elementary forms of consciousness, while man, whose mind is the cap-stone of the evolutionary structure, is the most regular and profound sleeper.

This suggests a second explanation for the lack of correlation we have found between school success and hours of sleep; namely, *that large quantitative differences in sleep may be fully offset by qualitative differences.* If this be true then

sleep cannot be accurately measured in units of time alone. It may be, as Claparède has suggested, that persons who habitually spend less than the average amount of time in bed enjoy a more profound sleep than do those who retire early and rise late. There can be little doubt that such qualitative differences do exist. It seems that the mind, when it realizes the time for sleep is short, is able to augment the speed of its recuperation.

We touch here upon the important but little understood question of the *educability of the sleep habits*. Edison and some other strenuous workers have insisted that the need which most people feel for eight hours of daily sleep is but the result of a mistaken mode of life—a bad habit—confirmed by long practice and by imitation plus auto-suggestion. Most of us do not find that this doctrine stands the pragmatic test of giving satisfactory results.

A third explanation for the lack of correlation between our sleep records and the marks for scholarship and intelligence would invoke still further the already mentioned *factor of safety*. It is possible that the margin of safety is so large that both body and mind will for many years withstand with apparent success a surprising deficiency of sleep, while at the same time the reserves of energy are being insidiously depleted and the powers of resistance undermined. It is possible that there are such cumulative effects which do not become evident until middle age or beyond.

That any sleep deficiency which may exist with these children does not produce its ill results during school age is indicated by the fact that there is no more correlation between short sleep and low marks in the upper range of years, twelve, thirteen and fourteen, than there is in the lower. It must be borne in mind, however, that both physicians and psychologists are learning that there are numerous disorders of body and mind which become evident first in adult life but which, nevertheless, are plainly traceable to an origin in childhood. This is true of certain insanities as well as also many cases of tuberculosis, rheumatism, dental caries, heart disease, etc. It would be rash indeed to infer that any mode of life is safe which does not bring immediate and apparent injury. If we

were limited to the evidence of immédiate effects it would be difficult to convict even such notorious enemies of healthy growth as alcohol or cigarettes.

The factor of safety, whose value is becoming more and more recognized in affairs of mental and physical economy, must be kept intact. We want not merely the strength to do the average work of each day in its turn, but we need to store the reservoirs of energy to the brim so that we may withstand the sieges of deprivation, disease, accident and overwork which are almost inevitable in the strenuous life of the modern man or woman. Ample sleep throughout the period of growth is, we may still reasonably believe, one of the means to this end.

If, as seems to be the case, our study offers evidence that the average hours of sleep secured by American children include a large margin of safety, we are not compelled to conceive of this average as representing in any sense an excess of sleep. This would be a fallacy analogous to that into which the late Professor James seems to have fallen in his oft-quoted address, *The Energies of Men* (20). Starting from the fact that most people are capable, in case of necessity, of accomplishing far more work than they usually believe themselves capable of accomplishing, Professor James concludes that we live below our rightful level of efficiency, that we have formed the "habit of inferiority" to our best selves, etc. He advises us to probe for our deepest levels of energy and to draw upon them freely; to find the limit of our capacity for a week or a month and to keep this pace all the weeks and months of our lives. This theory may be inspiring, but the writers know of no scientific evidence that will bear it out. A consideration of the part which the factor of safety plays throughout the biological world in reproduction and in the physiological safeguards, multiple control, etc., in the functioning of nearly all the organs of the body would seem to warrant the belief that the factor of safety, whether of work or sleep, should be preserved intact. To follow the advice of James would in all probability expose us to grave danger of nervous bankruptcy in periods of unusual stress.[2]

[2]See the suggestive discussion by S. J. Meltzer: Factors of Safety in Animal Structure and Animal Economy. The Harvey Lectures, 1908, pp. 139-169.

In the fourth place the lack of correlation between sleep and intelligence may be accounted for on the hypothesis *that the heightened brain activity which is necessary for high grade intellectual activity involves a kind of neural excitement which itself predisposes to wakefulness.* That is, the child of genius may be inherently less capable of sleeping long hours than the blockhead. At the same time it is possible that either will do his best work when living up to the limit of his sleeping capacity. The life cycle of the individual shows the same tendency to a negative correlation between mental efficiency and ability to sleep. The mental weakness of both childhood and old age demands a great excess of sleep as compared with the period of greatest mental activity between twenty and forty yeears, but this does not prove that the sleep of either the child or the octogenarian should be curtailed. (See Part III for further data on the relation of sleep to intelligence).

But if this theory is the correct one, why do not the findings reveal a *negative* correlation between sleep and intelligence? In reply it may be answered that an actual tendency to this negative correlation might exist but at the same time be counterbalanced by some other opposing influence. Can any such counter influences be adduced? One, at least, is theoretically reasonable, provided we can safely assume: (1) that children of the better class of families average somewhat higher in intelligence than the average for children of lower social status; and (2) that children of best social environment will be required to spend more hours in bed than children of poor social environment. Both of these suppositions are probably correct. The first, at least, is supported by considerable well-known evidence of a scientific nature. The argument would then run as follows: (1) Intelligence tends to correlate *negatively* with sleep; but (2) excellent home environment in which (3) high intelligence is more common, (4) tends to *encourage* sleep by affording better sleeping accommodations and more hours of quiet in bed. These two opposing factors may exactly cancel each other and so mask any correlation which might exist between sleep on the one hand and either intelligence or social status on the other.

Whatever the correct explanation may be for the lack of

evident correlation between hours of sleep and school success, intelligence and social status, it would be rash to conclude that the minimum amount of sleep secured by our children (ranging from about 9 hours at six to 6 hours at sixteen) is ample for their needs. It may well be that any individual child will attain his greatest mental efficiency only by sleeping the maximum number of hours *of which he is capable*. This maximum for an Edison may be only five hours, as compared with eight for a village cobbler; yet both Edison and the cobbler may be only the better for sleeping up to their respective capacities. But of this we cannot speak with any assurance.

Sleep is one of the many biological rhythms stamped into the organism by the movement of the planet on which we live. To interfere unduly with such an ancient and physiologically established rhythm would, theoretically, appear sufficient to menace the stability of the organism. Sleep is an instinct which involves the entire body, and is not simply a function of the brain. The brainless dogs of Golz and the brainless pigeons of Manaceïne exhibited the same sleep rhythms after cerebration as before.

James Chrichton Browne says that the lack of sleep is ever sowing a rich crop of neuroticisms. Psychiatrists tell us that many mental disorders are preceded by protracted insomnia. Loss of sleep has been experimentally shown to cause a decrease in the number of red corpuscles, while the beat of the heart is accelerated to compensate for the poverty of the blood. Far from being a bad habit, as Girondeau claimed, sleep seems to have been evolved as the best biological means of making possible intense periodic activity of mind and body.

It is worth while to remind the teacher that for some time after an illness more than the normal amount of sleep is desirable. The weakened condition of the body after an illness resembles in many respect the exhaustion of extreme fatigue. The most effective restorative in either case is sleep. The child returning to school after several days of absence from sickness is in no condition to make up by home study the lessons he has missed. Instead of assigning home study let the teacher advise extra sleep, relaxation and play that is not too exhausting.

It should also be pointed out that besides acting to recharge the batteries of life sleep has a settling and confirmatory influence upon the mental activities which precede it. To "sleep over a problem" is a means of transforming a chaos of puzzled mentation into order and clarity. The learning processes which are initiated during the work of the day take deeper root during the hours of sleep. In sleep, life purposes may mature and ideals take shape. Either for the mental or the physical worker sleep is, in all probability, an unsuitable field for the practice of economy.

On the other hand there is no justification for the exaggerated importance sometimes attributed to long hours of sleep. *Sleep is but one of the many needs of children,* and it is foolish to make it the scape-goat for all kinds of physical and mental evils as hygienists have so often done. It is possible that the quantity of sleep is less important than its quality, and that when disturbances of the latter occur they are more likely to be the effect of ill-health than its cause. Instead of directing our attention to the disturbed sleep as such it is wiser to search out the underlying trouble and to remedy that. We may even bear in mind the possibility of excess of sleep. This danger is strongly emphasized by Manaceïne, who finds it sometimes productive of albuminuria, of a slackening of the peristalic movements of the intestines with consequent tendency to constipation, and of chronic sluggishness of mind and body. As regards the school child, the wisest course in all probability is for us make the conditions such that the child will spontaneously sleep as many hours per day as he wants to sleep, while avoiding all conditions which would tend either to abbreviate or unduly prolong the sleep beyond this standard. Liberal allowance should also be made for genuine individual differences, for not all the range of variation which we have found in the hours of sleep for children of any particular age can be accounted for on the basis of habit and environment. There are undoubtedly physiological idiosyncrasies which make nine hours for one child equivalent to eleven hours for another.

(*Continued in May Journal.*)

SPECIAL CLASSES FOR BRIGHT CHILDREN IN AN ENGLISH ELEMENTARY SCHOOL.

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An ideal system of promotion would take account of (a) the innate mental ability of the pupils, and (b) their attainments in the fundamental subjects of school instruction. Doubtless the second of these factors is largely conditioned by the first, but as yet we have no satisfactory means of measuring either of them. The Binet scale has been offered as a measure of general intelligence and gives much promise of a more accurate determination of native ability, but it will have to be modified and standardized before it can be made to serve the practical needs of the schools, and aside from a few tentative scales in arithmetic and handwriting, no attempts have been made to measure attainments in school subjects. But the teacher is confronted by children who must be taught and for whom classes have to be formed, and hence he is obliged to fall back upon a "general impression" of the mental caliber of his pupils and upon the customary school tests for an indication of mastery of subjects. In default of a better standard "quickness of apprehension" has been taken as an index of mental ability, and on this basis the child who requires an entire school year to complete the work of a grade is considered *normal,* the one who can do the work in less time is designated *supernormal,* and the child who requires a longer time is put down as *subnormal.*

Not a few of the so-called subnormal or retarded children are victims of faulty classification at the very threshold of the school. There is often no attempt made at the outset to sift the material one has to deal with. Children who have scarcely any notion of number are grouped with those who can handle

number operations with some proficiency; children who are almost ignorant of the sound-values of the letters of the alphabet are grouped with those who can already read slightly. In short, children of all stages of progress are lumped together for teaching. How is the teacher to convert such heterogeneous material into something like a practically uniform whole? The fairest way is to come down to the level, and work at the pace to which the greatest number can adapt themselves. This means that the brightest scholars are often kept dallying, they lose interest in their work, and are sometimes a source of disorder in the class, while at the other end are some who cannot keep pace with the rest, and soon fall behind as the doomed retarded ones.

This is only one instance where children, before they have had any training, are expected to adapt themselves to the artificial conditions of the school; whereas it is the school that should rather at this stage adapt itself to their needs.

My school happens to be a large one, with about 800 boys on the roll, and therefore offers advantages for special classification. An attempt is made at the very start to take the fundamental subjects in hand systematically so as to secure adequate attention and regular advancement for each scholar in each of these subjects. At the beginning of each school year the brightest children of those that are transferred from the kindergarten, usually about 30, are placed in a special class (Special II) to do the work of Grades I and II in the twelvemonth. The rest are placed in Grade I and are divided into three small classes, of about 30 pupils each, to enable the teacher to get more closely into touch with them individually at this early stage. For the reading lesson a special regrouping, according to ability in this subject—good, medium and weak readers—is put into operation. All the "good" readers proceed to one of the three teachers of Grade I, the "medium" to another, and the "weak" to the third. In the course of the year some of the scholars are promoted from one of these sections to the next higher as soon as their progress warrants the belief that they would profit by such a step. At first the "weak" section is numerically the greatest, but as the year advances this group thins off, and the "good" ultimately be-

comes the largest group. Near the end of the year this special regrouping for reading is found no longer necessary. All the children can follow even the most fluent reader with comfort, except a very few who are withdrawn from their respective classes for special teaching.

In arithmetic a similar threefold, but independent regrouping, according to ability in this subject, is put into practice. The teacher who has the "weak" readers takes the "good" section in arithmetic, and *vicê versâ*. Promotion from one section to another is not so frequent. This classification is continued throughout the year in this, as well as in the next grade. For the other subjects the children stay with their regular class teacher.

It may be well here to indicate the standard of attainments for each grade in the fundamental subjects. Reading is the crucial test for promotion in Grades I and II; arithmetic becomes the crucial test from Grade III upwards. In the scheme below only one of the prose readers—the best known work—is given as a type, and the special book of poetry.

TABLE I.

Standard of Attainments for Each of the Grades in the Fundamental School Subjects.

GRADE I.

Reading.	*Arithmetic.*	*English Composition and Dictation.*
To read with fluency and intelligent comprehension any of the class readers, etc. Simplified fairy tales from Grimm and Hans Andersen, of standard difficulty about equal to that of end of Gordon Reader, Part III.	*Entirely Oral.* Commencing with analysis of number, the four simple rules are taught and illustrated concurrently within gradually increasing number range from 1-100. Later on, applied to simple operations with money, weights, and measures. No written work is done except at weekly tests, when the answers only are written in a book, which forms a record of the scholar's progress in this subject.	*Oral* only for first six months. Afterwards, oral and written, dealing with familiar scenes or incidents set forth in a picture, or reproduction in scholar's own words of a story read or told. Simple dictation in latter half year.

Grade II.

Reading.

As above, but of higher standard of difficulty.
O. and B. "Excelsior"
Poetry, Book II.

Arithmetic.

As above, but within extended range of Nos. 1-250.
More difficult problems.

English Composition and Dictation.

As above.
Higher standard of correct expression and spelling expected.
Simple dictation throughout year.

Grade III.

Reading.

Kingley's "Water Babies," etc.
O. and B. "Excelsior"
Poetry, Book III.

Arithmetic.

Compound rules—money, weights and measures, within range of child's general experience; very simple fractions and decimals to one place (but called tenths).
Problems involving combination of 2 or more rules.

English Composition and Dictation.

As above.
Higher standard of expression and correct spelling expected.
Dictation from reader.

Grade IV.

Reading.

"Alice in Wonderland," etc.
O. and B. "Excelsior"
Poetry, Book IV.

Arithmetic.

As above, but extended in range, and of higher standard of difficulty.
Decimals to two places.
Long division and reduction.

English Composition and Dictation.

As above.
Direct and indirect narration systematically taught.
Essays on familiar topics and incidents.
Dictation from reader.

Grade V.

Reading.

Conan Doyle's "The White Company," etc.
O. and B. "Excelsior"
Poetry, Book V.

Arithmetic.

Vulgar and decimal fractions treated more completely.
Practice: Bills, proportion, percentages.
How to obtain simple interest.
General Arithmetic leading to introductory algebra, symbolical representation, equations.
Mensuration: Areas of plane rectilineal figures; examples in wall-papering, carpeting, etc.

English Composition and Dictation.

More difficult stories for reproduction.
Higher standard of thought and language expected.
*Essays, as above.
Dictation from reader.

GRADE VI.

Reading.	*Arithmetic.*	*English Composition and Dictation.*
Kingley's "Westward Ho."	As above: also simple interest,—to find time, rate, principal.	*Essays on descriptive, imaginary or general topical subjects.
Shakespeare's "Julius Caesar."	Mixtures, averages, percentages, profit and loss.	Letters.
	Algebra: The four simple rules, factors, equations and problems.	Sentence structure and suitability of language receives special attention.
	Mensuration: Areas of rect. figures and circles: volumes.	Dictation —unseen.

GRADE VII.

Reading.	*Arithmetic.*	*English Composition and Dictation.*
Scott's "Talisman," etc.	Miscellaneous arithmetic.	Essays, as above, higher standard expected.
Shakespeare's "Merchant of Venice."	Mensuration, revision of work of last grade.	Dictation—unseen.
	Algebra up to quadratic equations.	

*As a guide to the pupils and also to help the teachers to obtain a nearer approach to a uniform standard of evaluating the essays the following scale of maxima has been drawn up, and each essay is stamped with this scale and is awarded marks in accordance with it:

10 marks for ideas.
4 marks for logical development.
3 marks for language.
3 marks for grammar, spelling and punctuation.

20—Total.

The time allotted to each subject and the character of the curriculum count for so much in the consideration of any school system that an account would be incomplete that overlooked such details. They are set forth in the following table:

TABLE II.

Time Table, in Hours and Minutes per Week.

	Grade I.	Grade II.	Grade III.	Grade IV.	Grade V.	Grade VIb.	Grade VIa.	VII.
Religious Instruction	3:30	3:30	3:30	3:30	2:45	3:30	2:45	3:30
Reading and Recitation of Poetry	5:0	4:30	3:50	3:55	3:55	3:30	2:45	3:15
Writing, Dictation and English Composition (oral and written)	5:40	5:30	3:50	3:50	2:40	2:50	2:50	2:10
English, including Grammar and Analysis	....	....	1:20	1:15	1:30	1:55	1:20	1:10
Arithmetic and Mensuration	4:0	4:0	4:0	4:0	3:40	2:40	3:10	2:20
Algebra	....	....	....	....	0:40	0:40	1:20	1:20
Nature Study	1:20	1:10	1:10	1:20	1:10	1:15	1:15	1:15
Drawing	1:30	1:40	1:40	1:40	2:0	2:0	2:0	1:40
Geography	0:40	1:20	2:0	1:50	2:0	1:50	2:0	1:30
Manual Work	0:40	:40	1:0	1:0	2:0	3:0	2:0	2:0
Singing	1:10	1:10	1:10	1:10	1:10	0:40	0:40	0:40
Physical Exercise	1:0	1:0	1:0	1:0	1:0	0:40	1:0	1:0
History	Exposition of Historical Reader.						0:35	0:40
French	....	....	....	....	....	....	1:10	1:0

Total, 24 hours 30 minutes per week.

Let us now return to the children and note their distribution at the end of their first school year (see Plate I). The boys in Special II, nearly all, proceed to Grade III, where for a year they have a relatively easy time and are allowed to mature, so to speak. A few exceptionally able ones, those well ahead of the rest in reading, arithmetic and English composition, and who are also physically fit, are placed in a special class—Sp. IV—to do the work of Grades III and IV in the next twelvemonth. Turning to the scholars in Grade I, the far greater bulk of them passes into Grade II. The crucial test here, as already pointed out, is reading. Those who fail to come up to the required standard are kept behind in Grade I till they have made sufficient progress to justify their being moved forward. Even among Grade I scholars some are found who call for special treatment. There are usually a few who, though at first they displayed no exceptional ability, yet in the course of the year made such advance in their work as to claim to be regarded of as high a mental level as those who have just passed through Sp. II. To meet the needs of these a special class—Sp. III—is formed to take them through the work of

Grades II and III in one year. A similar mode of procedure is adopted, wherever possible, in the distribution of the scholars from the other grades at the year's end. The backward or subnormal boys stay behind to go over the ground again in a large measure; the normal ones pass on to the next higher grade, and the supernormal ones to a special class to do the work of the next two grades in the coming twelvemonth.

Thus progress through the school lies along two parallel tracks—an accelerated path and a normal path, provided at different stages with shunt lines from one side to the other.

The most typical group of accelerated scholars are those who commenced their school career in Sp. II, and whom we traced at the end of their first year to Grade III. Let us follow them farther. If they justify the promise they gave earlier, they should be ripe at the end of their second year for another double promotion. Those who bear out this promise are transferred to Sp. V, to cover the work of Grades IV and V in their third school year. From there they pass to Grade VI, and thence to VII. Thus these pass through the school in 5 years, at the end of which period they usually gain a scholarship to a secondary school. Their course is indicated in Table V by the thicker arrows.

Such a scheme can only be carried out when there are enough bright pupils to form a special class for them. In the school year 1907-8 we had a rich crop of clever boys, and this system was in operation to its fullest extent. As a result of the special advantages accruing to the scholars from such a promotion scheme the boys of this school carried off in the following year no fewer than 25 out of the 100 scholarships offered to boys by the local education authorities.

But every practical teacher knows that the caliber of the class as a whole varies in different years. Even in the educational field the seven fat years are followed by seven lean years. When there are not enough bright pupils to form a special class the school system must be adapted to meet the needs of these scholars in another way. Then they skip entirely the next grade and pass on to the one beyond—for instance, from I to III, from II to IV, or III to V (see Plate I). This step undoubtedly entails extra labor on the part of the teachers.

Here one must count on their loyalty and energy. My teachers have always felt that the extra efforts put forth in these circumstances are amply repaid by the scholars' enthusiasm, by their greater intelligence and quicker apprehension, and by the stimulus they soon give to the rest of the class. And if we examine closely where the extra labor and attention come in, they are more apparent than real. For any of these bright lads who can read very well a book of Grade II, for example, will be able to hold his own in tackling a Grade IV reader with most of the newcomers from Grade III; and the same applies to English composition, spelling, etc. It is only in arithmetic where there is a marked difference in level, and even in this subject such boys will soon get abreast of the others.

In June, 1909, one of His Majesty's Inspectors who came to inquire into the system requested me to prepare a tabulated account of the distribution of the scholars according to age and grade. This might help to throw some light on the plan at work then. The table (Table III) is given just as it was furnished to the Inspector.

An important fact that should be mentioned in this connection is that Manchester receives an influx of foreigners from time to time, and some of the children of these immigrants find their way to this school, some starting as late as 13 years of age. In taking note of the retarded cases in the table some allowance should be made for the presence of these foreign late-comers. The preparatory class consists almost entirely of such, many of whom have never attended a school before. Another point worthy of note is that the average age of transfer from the kindergarten is about the scholar's 7th year; the ages range from about 6½ to 7½ years old:

TABLE III.

Southall Street Boys' School, June, 1909.

Grades.	Boys who on the 31st of July will be aged— 6	7	8	9	10	11	12	13	14	15	
VIIa	..	..	..	..	..	3	10	10	..	..	23
VIIb	..	..	..	..	..	1	10	13	2	..	26
VIa	..	..	..	..	6	14	16	6	3	..	45
	About a dozen boys were placed in this class straight from Grade IV. Here French is begun.										
VIb	..	..	..	..	1	1	20	17	1	..	40
Va	..	..	..	..	5	9	12	12	1	..	39
Vb	..	..	..	2	3	15	10	5	2	1	38
IVa	..	..	..	1	12	9	6	5	..	..	33
IVb	..	..	..	1	7	8	6	7	1	1	31
Special IV	..	..	2	12	10	8	1	..	1	..	34
	This class consists of special boys, and has been doing the work of Grades III and IV this year.										
IIIa	..	..	3	10	8	5	7	4	..	..	37
IIIb	..	..	4	7	9	9	6	6	..	..	41
IIIc	..	..	4	7	5	9	4	5	2	..	36
IIa	..	..	8	16	8	1	4	..	..	..	37
IIb	..	..	4	13	15	3	4	..	..	..	39
Special II	..	6	20	3	2	2	3	1	..	..	37
	Consists of picked boys from last year's Infants' draft and a few foreigners, and has been working Grades I and II.										
Ia	..	9	14	11	1	3	1	..	..	..	39
Ib	1	9	14	8	3	3	..	..	..	..	38
Ic	2	8	17	7	3	1	..	1	..	..	39
Preparatory	1	3	4	2	4	1	3	..	..	..	18
	Contains new arrivals from abroad.										

A month after the Inspector's visit brought us to the end of the school year, when these children were nearly all promoted. The table below (Table IV), which may be compared with the last, shows the redistributions—the ordinary promotions by a grade, as well as the cases of accelerated promotion to "special" classes, where numbers rendered such a course possible, or to classes two grades higher:

TABLE IV.

Promotion List, August, 1909.

From—	To Preparatory.	Grade I.	Grade Sp. II.	Grade II.	Grade III.	Grade Sp. IV.	Grade IV.	Grade V.	Grade VI.	Grade VIa.	Grade VII.	Grade Ex. VII.	
Kindergarten	9	57	25	..	..	..	..	..	..	..	..	..	91
Preparatory	5	10	2	1	..	..	..	..	..	..	..	..	18
Ia	..	5	2	28	4	..	..	..	..	..	..	..	39
Ib	..	9	..	26	3	..	..	..	..	..	..	..	38
Ic	..	11	1	24	2	..	..	..	..	..	..	..	38
Special II	..	..	6	1	27	3	..	..	..	..	..	..	37
IIa	..	..	..	7	24	6	..	..	..	..	..	..	37
IIb	..	..	..	1	31	6	..	..	..	..	..	..	38
IIIa	..	..	..	..	16	..	21	..	..	..	..	..	37
IIIb	..	..	..	..	10	..	30	..	..	..	..	..	40
IIIc	..	..	..	..	15	..	21	..	..	..	..	..	36
Special IV	..	..	..	..	..	..	7	17	10	..	..	..	34
IVa	..	..	..	..	..	..	7	25	1	..	..	..	33
IVb	..	..	..	..	..	..	10	20	1	..	..	..	31
Va	..	..	..	..	..	..	..	7	30	..	..	..	39
Vb	..	..	..	..	..	..	..	6	31	..	..	..	37
VIa	..	..	..	..	..	..	..	..	3	11	26	..	40
VIb	..	..	..	..	..	..	..	..	21	8	11	..	40
VIIa	..	..	..	..	..	..	..	..	..	..	..	24	24
VIIb	..	..	..	..	..	..	..	..	..	..	..	23	23

To make the stride easier for those who have had to "skip" a grade, the curriculum was readjusted at the beginning of the year with this end in view.

The school was divided horizontally into 3 main sections:

1. The Junior School, comprising Grades I and II.
2. The Middle School, comprising Grades III and IV.
3. The Senior School, comprising Grades V, VI and VII.

The Junior School forms a transition stage between the Kindergarten, on one hand, and the Middle School, on the other. The work accordingly partakes somewhat of the character and methods of the Kindergarten, while at the same time it prepares gradually for the more serious efforts and strain of the Middle School. The work of these two grades is assimilated closely in scope and method, but is carried to a more advanced stage in the higher grade. In the Middle School likewise Grade III is brought somewhat closer to Grade IV,

as a glance at the work set forth in Table I will show. In the Senior School Grade V forms the threshold through which every pupil now has to pass.

It is not such an unduly big stride now for a bright lad to take from the Junior to the Middle School by passing from Grade I to III, or from Grade II to IV, and likewise from the Middle School to the first stage in the Senior School, that is, from Grade III to V.

Grade V is a very important stage in the school course. It is a sifting ground where, during the year, the scholar is studied by the teacher with a view to discovering his special mental bent—whether it shows a literary, or mechanical, or artisitic bias. At the end of the school year, for the purposes of promotion, the pupils in this grade are classified according to their bias, and are transferred either to Grade VIa (Literary) or VIb (Mechanical).

In practice there are not enough to form a separate class for the artistic lads; they receive special individual treatment in either of the groups. These groups do not claim to be mutually exclusive; in doubtful cases the deciding factor for the Literary side is the ability to take up the study of French. For in the Literary class French is added to the curriculum and History receives systematic treatment. The Mechanical group devotes extra time to Manual Work (including metal work), and the arithmetic and drawing are allied more closely to the workshop and crafts. Further progress is indicated in the following diagram (Plate I):

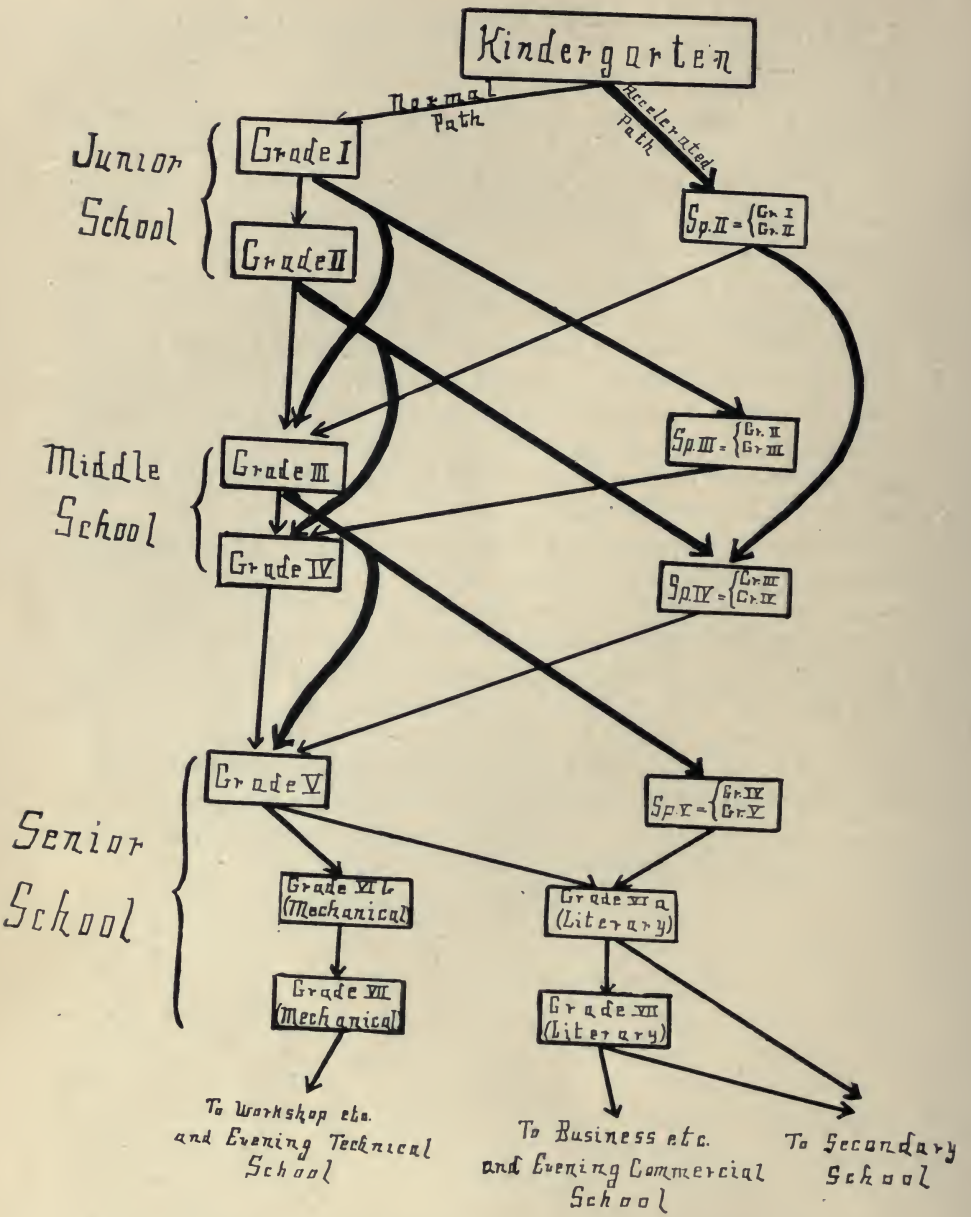

PLATE I.—Diagrammatic representation of paths of promotion. Accelerated directions are indicated by thicker arrows.

Both methods of promotion thus far described are brought into operation only at the end of the school year. But children sometimes brighten up wonderfully during the course of the year. Even some of the retarded ones, who have been kept behind, show at times enough improvement at the end of six months to warrant their being moved up. The hope of such promotion is often a valuable incentive to them. After the half-yearly examination deserving cases receive such treatment, and sometimes even after any of the quarterly examinations. And more, it is an unwritten law that as soon as a lad is practically "marking time," or can profit by the teaching in a higher class, he is sent onward. Of course, it is only the teachers' sense of justice and unselfish interest in the scholars that can make such a plan workable. "Promotion at any time" is particularly necessary where foreign children commence school at a late age.

A "record" case of rapid progress is that of a Roumanian boy of 12½ years of age who did not know a word of English when admitted, but had been to school in his own country. I give the time he spent in the different classes as taken from my diary. The gaps in the dates coincide with the holidays:

Grade Ib: November 11—November 18, 1907.
Special II: November 18—December 2, 1907.
Special III: December 2, 1907—May 14, 1908.
Grade V: May 27, 1908—July 17, 1908.
Grade VIa: August 15, 1908—July 15, 1909.

Thus this boy passed through the school in 18 months. At the end of this period he gained a scholarship to the Manchester Grammar School, where he has repeated his rapid performance and is now in the top form on the Classical Side, with every prospect of winning his way to Oxford University.

We may now summarize the various methods of promotion so far dealt with in their order of importance—importance being judged by the number of cases that come under their operation.

(a) Promotion at end of school year by the formation of a special class to work through 2 grades.
(b) Promotion at end of school year by "skipping" a grade.

(c) Promotion after term examinations.
(d) Promotion at any time.

Each of these is best adapted to meet a special set of circumstances and all can be put into practice in any school year.

Yet another method had to be resorted to at the commencement of the present school year in the unusual circumstances that arose. Owing to changes in the staff, the advent of new and raw teachers and other sources of disorganization during the previous twelve months, the teachers in the lower divisions were not in a position to decide with any degree of certainty which boys merited special promotion. All these classes were therefore advanced only one grade, the teachers receiving instructions to note carefully those scholars who were conspicuous for general ability and rapid progress. At the end of the half year the children in each of the first four grades were reclassified, the quicker scholars being placed in a special class to enable them to go on with as much of the work of the next grade as they could comfortably manage.

Experience teaches me that no single method can do justice to all deserving cases that arise. Any system of promotion must therefore be as elastic as possible to meet unusual circumstances. It is the school that has to adapt itself to the scholar, not the scholar to the school.

COLLEGE FRESHMEN AND FOUR GENERAL INTELLIGENCE TESTS.

MARGUERITE CALFEE,

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SUMMARY.

1. For college freshmen the correlations between class standing, card dealing, card sorting, alphabet sorting, and mirror tracing are uniformly much lower than those found by Burt, and indicate that under the conditions of the experiment the connection between the abilities involved is negligible. The correlations for twelve-year-old elementary school boys in the same tests are considerably higher than for the freshmen.

2. In all four tests tried with college freshmen, the girls are uniformly faster than the boys. The difference in time alone, based on the distribution curve, is large enough to be significant. This result seems due to some real sex difference at this age, between 18 and 19 years, though selection as a basis for college entrance is not ruled out.

INTRODUCTORY.

The material presented here was suggested by reading Burt's article (1) on general intelligence tests. He used a series of such tests on elementary and high school boys, and showed that the correlation between these general activities and their school standing was decidedly high. All of the tests used by him could be easily applied to college freshmen, and, providing they showed the same degree of correlation, would give us a valuable means of estimating general ability. Only four of the tests reported by him are used here on college students. These will be described below.

The Subjects.

The subjects may be divided into three main groups. The first, composed of ten advanced students in psychology, was used simply as a check on method, and will not be referred to again. The second group, whose record constitutes the main portion of this report, was composed of 115 first-year students in the academic department of the University of Texas. The list was prepared by the dean, and no one interested in the outcome of the experiment took part in selecting the names. This selection of subjects used all persons whose names came in the first seven letters of the alphabet. From this number 103 complete records were obtained. By pure chance it happens that 51 of these records are by boys and 52 by girls, making practically an equal division on the basis of sex. The third group was 30 boys in the elementary schools of Austin, Texas. The records of this group form a basis of comparison with the University freshmen and with the work of Burt's elementary boys.

Selection of Tests.

The selection of tests was governed largely by apparatus available and laboratory space. Ease of application was, however, considered an important essential. The tests used were card-dealing, card-sorting, alphabet-sorting, the mirror test and the spirometer test for vital capacity. It was thought that the latter test might prove significant, but little of value came from its use beyond obtaining a series of records at the ages used.

In the card-dealing test 50 ordinary playing cards were used. Each subject dealt the cards as rapidly as possible, one at a time, into five piles, backs uppermost. For the card-sorting test the so-called 'flinch' cards were used. These are cards with the digits from one to ten printed in bold-faced type on them. The same digit appears twice on each card, tops together, so that it is a matter of indifference how the card is turned, for one of the digits is always right side up for the reader. Fifty cards were used here also. Five different digits were used. This gives, when the mixed deck is distributed, five

piles of ten cards each; each one of the ten cards in a pile, when no error is made in distributing them, should bear the same digit.

The alphabet-sorting was copied directly from Burt's directions, except that three alphabets were used instead of two. "Each letter of the alphabet is boldly printed upon a single white card about 20 mm. square. The (seventy-eight) cards were laid before the subject upon a large sheet of heavy cardboard. The letters were placed right way up, but arranged in irregular or 'chance' order in three rough rows. The subject was not allowed to see them until he commenced the experiment; he was instructed to pick out in order, and to arrange in sequence in two rows below, one complete alphabet from the three before him. He was directed to work through the alphabet in order continuously, not to pick out letters as his eye fell on them, and was started by a prearranged signal" (1, p. 138). In our test the arrangement of letters was assured the same for each subject and the test made somewhat more difficult by printing the order of letters desired on the large cardboard and placing the movable letter squares on these stationary letters. Instead of leaving blank table or cardboard when a letter was removed, this method left a printed letter, the same as the one removed, before the subject. The difference in appearance was enough to prevent errors, but still slight enough to demand close attention to the process of selection.

The sheets for the mirror test were modified from Burt's (1, pp. 145-9) and Starch's (2) arrangements. A circle 16 cm. in diameter was drawn, and on the circumference of this circle twelve equal distances were marked. This marking was indicated on the test sheets only by a pinhole for the center and one for each of the marks on the circle, together with the digits '0' to '12' in mirror handwriting. The digits were placed in irregular order, with the exception of '0,' which always marked the center. Six sheets were prepared for each test. The arrangement of digits differed on each of the six sheets, but the sheets came in the same order for all the subjects.

All four tests were completed by each subject at a single sitting.

Correlations.

The scholastic grades used in these correlations are those of the first term (three months) in the University. If we correlate the second term's work with that of the first, we get a coefficient of .66. This coefficient of correlation may be raised to .72 by eliminating the second term's grades of only three students. The students mentioned made low grades the second term because of unavoidable accidents of unusual character. This difference in correlation shows that the grades used are not entirely satisfactory, though they were the best available at the time.

The grades of students at the University are recorded by letters, A, B, C, D, E, etc.; E means failure. All the letters, or grades, made by a student, except the physical training grade, were used. For purposes of the experiment these letters were turned into their approximately equivalent numerical percentage. The number obtained by averaging these determined a particular student's rank. It was impossible to obtain any estimate of the student's ability from the instructors so early in the year.

All correlations in the table are calculated by the use of the Spearman 'foot-rule' method described by Whipple (6) and used by Burt in his work. The R-values were converted into r-values by the use of Table 6 in Whipple (6, pp. 34-37).

TABLE I.—*Raw Correlations.*

Test.	Group.	Card Sorting.	Card Dealing.	Alphabet Sorting.	Grades.	Mirror Test.	Lung Test.
Card Sorting.	Burt ...	..	.72	.74	.52	.34	..
	Elem. ...	..	.71	.41	.50	.26	..
	Boys ...	..	.50	.31	.29	.11	—.08
	Girls ...	...	.45	.37	.28	.20	—.16
Card Dealing.	Burt ...	.72	..	.66	.44	.40	..
	Elem. ..	.71	..	.25	.07	.11	..
	Boys ...	.50	..	.31	.28	.19	—.11
	Girls ...	.45	..	.29	.13	.37	.00
Alphabet Sorting.	Burt ...	.74	.66	..	.61	.29	..
	Elem. ..	.41	.25	..	.51	.06	..
	Boys ...	.31	.31	..	—.06	.22	.28
	Girls ...	.37	.29	..	.25	.29	—.03
Grades.	Burt ...	.52	.44	.61	..	.67	..
	Elem. ..	.50	.07	.51	..	.07	..
	Boys ...	.29	.28	—.06	..	—.07	.23
	Girls ...	.28	.13	.25	..	.19	.00
		—	—	—	—	—	—
	Total..	.32	.25	.17	..	.16	—.11
Mirror Test.	Burt ...	.34	.40	.29	.67	..	..
	Elem. ..	.26	.11	.06	.07	..	..
	Boys ...	.11	.19	.22	—.07	..	.06
	Girls ...	.20	.37	.29	.19	..	.05
Lung Test.	Boys ...	—.08	—.11	.28	.23	.06	..
	Girls ...	—.16	.00	—.03	.00	.05	..

TABLE I.—In the line marked 'Burt' are the raw correlations found by Burt for similar tests on elementary students. 'Elem.' indicates those found by us on a group of elementary students. 'Boys' and 'Girls' designate the freshmen, and 'Total' the correlations of the four tests and the grades of the freshmen irrespective of sex.

Burt's corrected coefficients are in every instance higher than the ones quoted. However, the coefficients worked out here are based on a single application of the test, while his are averages of two or more applications. The elementary boys' correlations agree most closely with his results.

In this experiment the card-sorting test has given the highest correlation with college grades. For the boys, card dealing is next highest, but comes last for the girls. Alphabet-sorting and the mirror test both give negative correlations with grades for boys. All the tests gave positive correlations with girls' grades, while only card dealing and card sorting are positive

with boys' grades. Such a preliminary trial as ours suggests that these tests are less valuable as general intelligence tests for college freshmen than for elementary boys.

The order of correlation differs from Burt's (1, pp. 161-162). The alphabet sorting and mirror test lose their favored positions in the hierarchy. The writer is of the opinion, moreover, that this is a sign of habituation away from such tasks; that the freshmen, on the whole, give evidence that these tests are far removed from their usual activities. If this prove true in further experimentation, we should have in these tests a negative proof of growth, *i. e.*, increasing age and development are characterized by decreasing correlation in these tests.

A SEX DIFFERENCE.

TABLE IIa.—*Averages, etc., of the Four Tests.*

Unit of Measurement.	Sex.	Age, Years.	Grades. Basis 100%.	Card Dealing. Sec.	Alphabet Sorting. Sec.	Card Sorting. Sec.	Mirror Test. Sec.	Lung Test. Cu. in.
Averages.	B...	19.83	70.5	31.2	92.5	47.8	101.	249.8
	G...	18.83	76.2	25.9	76.7	38.9	64.4	158.8
M. V.	B...	1.91	6.1	6.	17.6	5.9	33.3	33.5
	G...	1.75	7.1	4.3	10.5	5.1	27.4	19.2
P. E.	B...	1.33	5.83	4.5	18.25	4.62	28.46	28.75
	G...	1.05	7.08	3.5	13.5	5.	22.33	16.

TABLE IIa.—The number of subjects concerned is as above, 52 boys and 51 girls. In the mirror test the figures given are based on the averages of the six trials of each subject. The vital capacity figures, measured in cubic inches, are based on the best of a series of three trials made by each subject.

TABLE IIb.—*Distribution in Percentages.*

	Sex.	Age. Years.	Grades.	Card Dealing.	Alphabet Sorting.	Card Sorting.	Mirror Test.	Lung Test.
Per cent. of cases in semi-quartile range.	B...	53.8	68.6	70.2	66.6	84.3	74.5	82.3
	G...	45.1	75.	53.8	46.1	44.3	34.6	40.4
Per cent. of cases that reach opposite sex's median.	B...	70.6	27.4	23.5	31.3	8.	6.	90.
	G...	28.8	71.1	75.	75.	90.2	90.4	2.

TABLE IIb.—The first part of this table is a series of percentages based on the distribution areas in each test of all the subjects together irrespective of sex. "Per cent. of cases in semi-quartile range" was found by using the first portion of the method for determining the P. E. above. The girls and boys were considered in two different groups. The number falling inside a semi-quartile range was noted, and the percentages of each group determined on the basis of the whole number of cases in the range. Theoretically, when two groups of equal size are compared for any single character, an equality of percentages should appear. The second shows each sex's relation to the other's medians, which are practically the same as the averages given above (4).

Records made by the elementary boys tested are not given in this table, as they compare closely with the results given by Burt, except where changes in the method of giving the test are involved.

The distribution curves that correspond to these averages, M. V.'s and P. E.'s, were plotted at first on the basis of various intervals. The interval used finally was three seconds. For the grade distribution, a difference of five numerical points was taken as the interval, *e. g.*, all the students whose grades fell between 65 and 70 filled one rectangle on the distribution area. Unit groups with differences of 10 cu. in. were used in the distribution of the subjects in the vital capacity test. The results in the tables for the four intelligence tests are, therefore, strictly comparable. Those for age, grade, and vital capacity vary slightly, but in negligible amounts. The principal skew falls on the superior side in practically all cases, *i. e.*, on the side of the higher grades, more rapid rates, greater vital capacity, etc. In the distribution curves for the 103 subjects, irrespective of sex, the boys' results are the significant factor in skewing the age and vital capacity curves; in the others, the girls' results are responsible for the skew.

When the averages for the mirror test were determined for the boys and girls separately, we thought definite corroboration had been obtained for the statements made by Whipple (6) and others that girls show the effects of practice and greater familiarity with the mirror. However, the card-sorting test gives a difference between the sexes that is almost an exact equivalent. The vital-capacity test shows, where we ordinarily expect it, a similar difference between the sexes, but here the skew in the curve is made by the boys. For example, in the 'percentage of cases in the semi-quartile range,' under the headings 'mirror test' and 'lung test,' respectively, we have boys 74.5% and 82.3%, for the girls 34.6% and 40.4%; but, as shown by the percentage just under these in the table, these skews are on precisely opposite sides of the modes. The alphabet sorting and card dealing show similar differences, but less in amount. Grades and age approach equality.

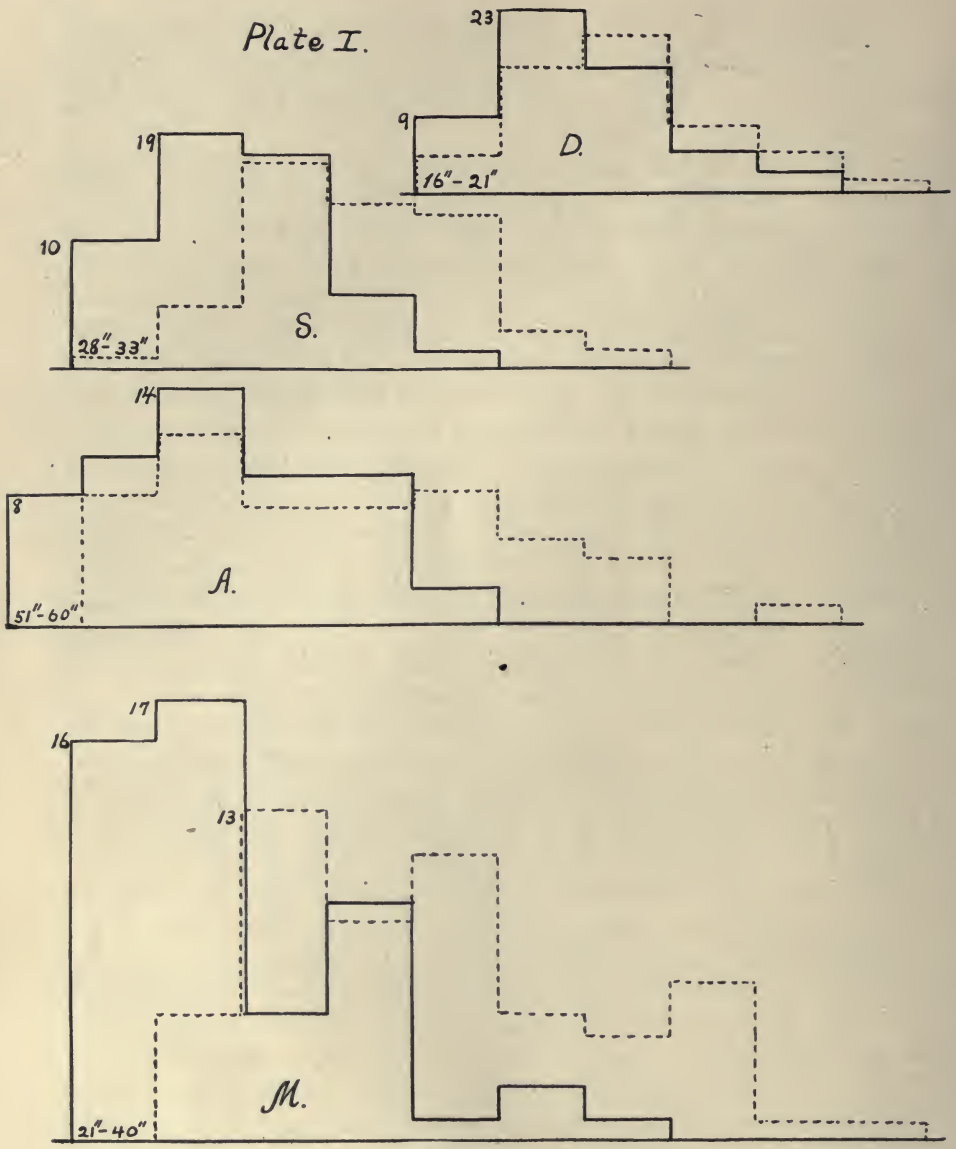

PLATE I.—The rectangles in this plate show the distribution for boys, dotted lines, and for girls, heavy lines, in the four tests, mirror drawing, 'M,' alphabet sorting, 'A,' card sorting, 'S,' and card dealing, 'D.' These curves are drawn on different bases, to show the approximation to a normal curve, and are not strictly comparable to the percentages given in Table IIb. The number of cases in the first rectangle and in the mode is indicated at the upper left-hand corner of the rectangle.

In the group of college freshmen used, the writer was unable by careful questioning before the test to find that there was any difference in the sexes with respect to their familiarity with cards, and certainly in the new test, alphabet sorting, there could have been no great differences in previous training.

There seems instead to be a significant sex difference in attitude and in method toward tests of this simple type. Obviously, this conclusion will not apply to the individual boy or girl, or when selections are made, as the best of the boys compared with the best of the girls, or the average with the average, etc. (Miss H. B. Thompson's experiments show this especially well.) (3.) However, it is still possible that we are dealing with a selected group.

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PSYCHOLOGICAL TESTS IN VOCATIONAL GUIDANCE.

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Psychological tests in Vocational Guidance are of two sorts. Those of the first sort have for their aim the selection of people for positions. Such tests are now being put into practical application in several occupations and industries. They vary in kind from the simplest sensory tests to complicated evaluations of complex mental operations.

Among the simplest of such tests are those for vision, hearing and color discrimination given to all recruits in the army, navy, and marine corps. Similar but more exacting tests of the same sorts are given to candidates for licenses as pilots and for positions as officers of ships.

Railroad employes, and in some cases those of street railroads, are subjected to tests of vision, hearing, and color discrimination. In the case of the trainmen, the color discrimination tests result in the rejection of about four per cent. of the applicants. The tests are repeated every two years for all the men and at intervals of six months for those suspected of defects in color discrimination. In all of these cases the tests have for their object merely the detection and rejection of unfit applicants.

In at least three industries psychological tests are in use which are more highly developed in character and which have for their object the more difficult task of selecting from among all the applicants those best fitted to perform the work.

The first instance is the work of Mr. S. E. Thompson, who used reaction-time tests in selecting girls for the work of inspecting for flaws the steel balls used in ball bearings. This work requires quick and keen perception, accompanied by

quick, responsive action. Mr. Thompson measured the reaction-time of all the girls and eliminated those who showed a long time between stimulus and reaction. The final outcome was that thirty-five girls did the work formerly done by one hundred and twenty; the accuracy of the work was increased by 66 per cent.; the wages of the girls were doubled; the working day decreased from 10½ hours to 8½ hours, and the profit of the factory was increased.

The second of the three cases is the work of Münsterberg of Harvard, in testing street-car motormen with the object of selecting those least liable to be responsible for accidents. From several viewpoints this problem is of great practical importance, inasmuch as some electric railroad companies have as many as 50,000 accident indemnity cases per year, which involve an expense amounting in some cases to 13 per cent. of the annual gross earnings.

The motormen were examined by means of a somewhat complicated laboratory apparatus constructed for the purpose of testing their powers of sustained attention and correct discrimination with respect to a rapidly changing panorama of objects, some moving at different rates of speed parallel to the line of vision of the subject, and others crossing it from right and left.

The results of the experiments demonstrated that the tests were fairly accurate in sorting the motormen out as to their efficiency as demonstrated by actual service. The tests require about 10 minutes for each individual. Even in their still unperfected form their application would result in the rejection of about 25 per cent. of those who now are employed as motormen. There can be little doubt that this would bring about a large reduction in the number of deaths and injuries from street-car accidents.

The third and last example of the application of psychological tests to the selection of employes in industry is the series of tests of telephone operators. These also were conducted by Münsterberg.

The American Telephone & Telegraph Company employs some 23,000 operators. Applicants for positions are given a

preliminary training of three months' duration in the company's schools, during which time they receive salaries. So many eventually prove unfitted for the work that more than a third leave within six months, involving a financial loss to the company running into very many thousands of dollars each year. The object of the tests was to develop methods whereby the unfit girls could be eliminated before instead of after entering the service.

The girls were examined with reference to memory, attention, general intelligence, space perception, rapidity of movement, accuracy of movement, and association. The results showed that the girls who gave the best results in the tests were most efficient in practical service, while those who stood at the foot of the list failed later and left the company's employ. It seems fair to conclude that when such tests are perfected, short examinations of a few minutes each will prevent thousands of applicants from wasting months of study and training in preparing for a vocation in which they cannot succeed.[1]

In the cases so far reviewed, the persons tested have been applicants for positions. With a somewhat different purpose Prof. James E. Lough of New York University has tested beginning students in stenography and typewriting to determine which ones possess the abilities which will enable them to succeed. The tests used are designed to measure the subject's ability in habit formation. The experiments are still under way, but already results have been secured which warrant the conclusion that a method has been devised which successfully separates the fit from the unfit candidates.

In addition to these cases in which psychological tests are being successfully applied to vocational problems, several pieces of experimentation are now under way to develop similar tests for marine officers. Ricker of Harvard has constructed apparatus for testing chauffeurs. Whipple of Cornell has done some work with tests for motormen. Seashore of Iowa has published a most careful study of tests of the

[1]The accounts of the tests of motormen and telephone girls are taken from "Psychology and Industrial Efficiency," by Hugo Münsterberg. Houghton-Mifflin Company, Riverside Press, Cambridge, 1913.

ability of a singer. So far as is known, no work in this general field is being done in Europe.

All of the tests referred to up to this point are of the sort mentioned at the outset. All of them have as their purpose the selecting of persons for positions.

The second sort of psychological tests in vocational guidance are those having for their purpose the selecting of positions for persons. Up to the present time none has been developed, although expressions of a longing for them and faith that they will ultimately be discovered are features of the literature of the vocational guidance movement. Even definite attempts in this direction are few. In Chicago, Dr. McMillan is doing some hopeful work. In Cincinnati, Mrs. Woolley has records of tests of the intellectual abilities of 800 children and records of their industrial success or failure, and hopes to correlate the two sets of data.

In various parts of the country vocational experts are at work who base their decisions not on the results of psychological tests, but rather on character diagnoses made from an inspection of the applicant and from a general evaluation of his answers to questions about himself. The defect of this method is that the questions are put for the purpose of revealing the personality of the subject, but since the replies cannot be evaluated until the questioner has some basis for knowing with what degree of truth and significance they have been answered, the whole effort tends to move in a circle. Some of the experts who employ these methods unquestionably secure good results, but until their tests become objective rather than merely observational, and until the results are definitely recorded so that they can be accurately studied, it cannot be claimed for them that they have attained the dignity of scientific status and reliability.

Nevertheless, the present situation is that we already have some tests for selecting people for positions and no tests for selecting positions for people. The reason is not far to seek, for in one case the problem is vastly more simple than in the other. When we select people for a position, our problem is to sort out the more fit from among the applicants. This involves the development of methods for discovering the degree

to which each candidate possesses the needed qualifications for one kind of work.

When the object is to select a position for a person, the problem is to discover which one of a vast number of possible sorts of work the person is best qualified to do. The difficulty arises from the almost unlimited number of possible alternatives.

At the present time we possess a rudimentary knowledge of the qualifications demanded in four occupations,—those of inspector of bicycle balls, motorman, telephone operator, and typewriter. Moreover, in the cases of at least two of these occupations the tests required for even a rough sorting of the applicants are numerous, long, complex, and must be given by a trained psychologist.

Now the total number of separate classes of gainful occupations listed in the Occupational Index of the United States Census is 9326, and many of them should be split into several sub-divisions. This reveals something of the magnitude of the task of sorting children out according to their vocational destinations.

Nor is the mere number of our occupations the only difficult feature to be faced. Modern industry is subdivided into occupations of which teachers and psychologists have, as a rule, slight knowledge. For example, if we open the Occupational Index to "S," we find a list like the following:

shooter	skimmer	sleever	smelter
shoveler	skinner	slider	smither
silker	skiver	slipper	smoker
singer	slasher	slitter	smoother
sizer	slater	slubber	snapper
skeiner	slaughterer	slugger	soldier
skidder			

Now, when we propose to guide children into vocations, we must remember that large numbers of them are going into just such vocations as these. It is true that only a part of the 9326 gainful occupations are available to the children of any one locality. It is also true that the same sorts of tests would undoubtedly serve for many different occupational examina-

tions. Again, we must remember that we are using a false analogy when we refer to fitting square pegs into round holes in talking of vocational misfits, for people and positions are both plastic, not rigid, and much mutual change of form often takes place without injury to either person or position.

Nevertheless, even after all allowances are made, the inevitable conclusion remains that in vocational guidance the greatest field of immediate development for psychological tests is choosing persons for positions rather than in selecting positions for persons.

The possibilities in the former field of effort are inspiring. When the best possible adjustment shall have been attained between work and workman, each one will have his full opportunity to achieve at least something for commonwealth and commonweal. The tasks of the world will be better done and the workers will receive greater rewards, deeper joy, and fuller satisfaction in their doing.

ABSTRACTS AND REVIEWS.

A. A. Brill, Ph.B., M. D. *Psychanalysis: Its Theories and Practical Application.* Philadelphia and London: W. B. Saunders Company, 1912. Pp. 337. $3.00.

This timely book which "reproduces the ideas of Professor Freud" as the dedication, with all possible frankness, states, is the most elaborate account so far in English of the doctrine of the pioneer psychanalyst. It actualizes and practicalizes Freud.

The material of the volume can perhaps best be indicated by a transcription of the twelve chapter-headings; they are as follows: "I, The Psychoneuroses: The development of Freud's conception of the psychoneuroses and psychoses, their relation to the psychology of dreams, sex, and the psychopathology of every-day life. II, Dreams: Their structure and mechanism, technique of interpretation, symbolism and their relation to the neuroses and psychoses. III, The Actual Neuroses: Neurasthenia and anxiety neurosis, their symptoms, mechanism, etiology and relation to the psychoneuroses. IV, The Compulsion Neuroses (Obsessions, Doubts, Phobias): Their relation to the sadistic component and the psychology of love and hatred. V, Psychanalysis and the Psychoses: The work of the Zurich school—the association experiment—complex theory—mechanism of delusions and hallucinations. VI, Psychological Mechanisms of Paranoia: Its relation to homosexual wish-phantasies. VII, Psychopathology of Every-day Life: Freud's conception of consciousness, unconscious, and foreconscious. VIII, Hysterical Fancies and Dreamy States. IX, The Oedipus Complex: The latent influence on normal persons; its negative manifestations in the psychoneuroses and psychoses. X, The Only or Favorite Child in Adult Life: Fixation on early parental images; the psychology of the Mother-in-law. XI, Anal Eroticism and Character. XII, Freud's Theory of Wit: Its relation to the dream and unconscious." An excellent index is found in its usual location, and (almost as important nowadays in a scientific book—and this is saying a good deal) a list of references to standard literature has place at the end of each chapter. Chapters VII and VIII are properly introductory to the remainder of the material in the book and should be read first.

It is to be hoped that the majority of the academic psychologists

in Britain and America will come in adequately long contact with this book—and then enlarge their concept of mind to its modern dimensions, inclusive, that is, not only of subconsciousness, but of the pervasive instinct or impulse of sexuality. Here is the needful material easily in their hands, the ready means by which the long decadent film-consciousness to which most of them pray may be replaced by a more scientific, practicable, yes more rational, idea of mentality as the on-rushing stream itself, pure experience on its surface to be sure, but, altogether, infinitely more than that—dynamic, effective, momentous, a somewhat that can *do* as well as be. At the present time academic psychology truly needs this book's material, not only in its libraries, but in the living substance of its didactic theory. Then would psychology be other and perhaps more than metaphysic, later than Aristotle, something vital and interesting and of use to man—the science, at length, as Wm. McDougall terms it, "of the behavior of living things." That's just it—out of the depths which psychanalysis helps to reveal, come the motives of behavior, dynamic imports of which the film—or surface—consciousness is normally forever ignorant. However the discussion may eventuate as to the respective therapeutic advantages of the different methods (why should not each specialist use every method?), Freud's eternal contribution to descriptive psychology as the science of behavior must be recognized by all.

In some respects the Preface is the most important part of this valuable book of Doctor Brill's—it contains information of the most essential kind which would well find place, somewhat extended, in a first chapter, for there are some no longer children, it must be suspected, who sometimes ignore the prefaces of books. Among other things, the following quotation, it seems to the present reviewer, cannot be too strongly emphasized in this connection everywhere for some years to come: "It is hardly necessary to mention that we are criticised for delving into sexuality. This is quite true, but it is a question whether it merits criticism. Our critics seem to have no conception of Freud's idea of sexuality. To us the term is very broad, it really comprises the whole love-life of the individual. As soon as we enter into the intimate life of the patient we are sure to find sex in some form, and *the best indication of an abnormal sexual life is an apparent absence of the sexual factors*" [italics mine]. This is wisdom, for he who has no love, no sexual-

ity, is not complete; and listen to a voice that long antedates Freud's:

"The sense of the world is short,
Long and various the report:
To love and be beloved;
Men and gods have not outlearned it,
And how oft soe'er they've turned it,
Not to be improved."

Emerson needed no psychanalysis to make him certain where love stands in this world of ours—and is there any who today doubts that the prototype of all love we know bases itself in the love which peoples the Earth?

Discussion of the more radical aspects of Freud's theory certainly is not called for in connection with this book, for Doctor Brill undoubtedly represents them accurately. It can scarcely be doubted that in some respects all orthodox Freudians are the victims of insistent ideas. The Oedipus complex, for example, has attracted attention probably far out of proportion to its importance in the run of cases and in the unneurotic especially. Again, some of the dream symbols we read about so continually seem arbitrary and far-fetched.

In all the psychanalytic literature one deplores the tainted wealth of illustrations and examples from the case-history files—what neurological science needs, rather, more than these is constructive psychophysiology giving general principles that may be applied to all cases as they come to treatment, rules of action based on sound neurologic precepts. Doctor Brill's book only follows the precedence in this respect—but does it amply.

This well-written and well-published volume is a serviceable contribution to the abundant American literature on a broadening subject of much importance and interest, and for its own sake as well as for the foreign doctrine it promulgates, it is cordially recommended to all who need it.

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W. H. HECK. *A Study of Mental Fatigue in Relation to the Daily School Program.* Lynchburg, Va.: J. P. Bell Company, 1913. Pp. 27.

This monograph is the report of an experiment testing the validity of the prevailing American opinion relative to the curves of fatigue

in relation to the daily school program, and the suggestions based thereon. Using a modification of Test No. 7 of the Courtis Tests in Arithmetic, the author tested 1153 boys and girls in grades 4A, 4B, 5A, 5B, 6A and 6B of four New York City schools. (Thirty of the forty classes tested were in grade 5A and 5B.) Each ten-minute test, given at approximately 9:10 A. M., 11:05 A. M., 1:10 P. M. and 2:30 P. M., consisted of three examples each in addition, subtraction, multiplication and division.

The results show (1) in *quantity* of work done, as compared with the first period of the school day, a respective increase of 1.57, 1.64 and 2.36 per cent. at the second, third and fourth periods; (2) in *quality* of work done a respective decrease of 1.51, 1.41 and 2.28 per cent. at the second, third and fourth periods.

From these facts the author draws six conclusions, some of which are probably opinion rather than conclusion based upon the experiment.

The experiment is interesting and the results are not startling even to those who believe that children, as well as adults, become tired after five hours of work such as a school, which is performing its function, ought to demand.

The author, I believe, accounts for the results in this particular experiment when he points out that the four fundamental operations in arithmetic, which were used in this test, become partially automatic in well-drilled children and therefore may not be affected by fatigue. May it not have been that the average fifth-grade pupil took the test as recreation since he was relieved from his regular class work to engage in a semi-automatic activity for 10 minutes under a new director? The statement of the author concerning the interest during these tests would seem to answer this in the affirmative. Unfortunately we have not yet reached that point where we can make all of the fifth grade boy's work appeal to him as recreation; even "with sound bodies, a hygienic school, proper classification, frequent relaxtion, a vital and varied curriculum and live teachers," there will still be work for the pupils to do, and that kind of work which so many of us have believed causes fatigue.

If, as the author says, the fatigue is so small as to be almost negligible in school management, it is difficult to understand his reason for preferring a two-hour period at noon in place of one.

The conclusion that "unhygienic conditions in the school and physical defects, however slight, in the children are undoubtedly the great causes of fatigue in most schools," is a significant one. This would seem to warrant giving fatigue a prominent place in school management.

One looks in vain in the results for the basis of the conclusion that "the decrease in quality of work of children as the day advances, supposed to be more or less general in schools, is due less to a using up of the energy-producing material in the nervous system by the body and an autopoisoning of the nervous system by the waste products from this process, than to a loss of interest in the school work with its lack of vital and varied appeal and its monotony of instruction and environment."

The wholesale conclusions, even though tentative, concerning the relation of fatigue and school management are hardly warranted by the experiment which is limited mainly to children who are in the intermediate grades—a period of school life that admittedly presents many anomalies.

Educators will certainly welcome the results of the other experiments, which, as the author says, must be made before any settled opinion can be advocated with assurance.

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THE
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EDITORIALS.

THE NATURAL METHOD IN LANGUAGES.

It is interesting to observe that at the convention of professors of French recently held at the College of the City of New York under the auspices of the Federation of French Alliances in the United States and Canada there was a note of protest against the "natural method" in teaching French on the ground that it involves a loss to culture. In view of the increasing use of this method in modern languages and its extension to Latin such a protest challenges attention. The traditional method of teaching languages involves a thorough drill on grammatical forms and syntax, the translation of certain texts which are made the basis for further drill on forms and constructions, and the translation of more or less disconnected English sentences into the foreign language—again primarily for drill on linguistic form and usage. The whole procedure emphasizes the formal and especially the visual aspect of the language, and when the work is well done it must be admitted that the pupil develops an alert grammatical sense which might reasonably be expected to show some transfer to other languages, and which constitutes a good foundation for further study of the literature of that language. But the pupil has had no training for, and hence has no ability in, using the language as a tool for the expression of

thought, and is therefore helpless when called upon to converse in it. The advocate of the "natural method' discards the formal grammar grind, builds up a vocabulary from the pupil's surroundings, forces him to hear and speak the language continually, and under favorable conditions secures a considerable fluency in its use. Which result is more advantageous for the pupil? In view of the fact that not one pupil in ten will have occasion to use the language after his study of it is discontinued, the question becomes a serious one and is worthy of more experimental study than it has received.

J. C. B.

THE EDUCATIONAL EFFICIENCY ENGINEER.

The child knows about its body before it knows about its mind. The material sciences are studied and understood before the mental sciences. So the efficiency engineer is first recognized on the side of material economy. Even his application of scientific management to the teaching of a university subject like physics has been approached mainly from the financial point of view. But efficiency engineers who have made such notable improvemnts in the economy and efficiency of crude labor, as in shoveling coal, or of skilled labor, as in brick laying, have made the psychology of movement the basis for their advancements. Our national government and the various state assemblies are employing efficiency commissions headed by experts to reduce the expense and to improve the quantity and quality of output. This practice has come to stay, and it is reaching down into our school systems.

In education we are now facing and welcoming the beginning of the application of scientific management to learning, to discipline, and to school organization and administration. It is only a beginning, and it will have no end. It will mean virtually the establishing of a new profession. The educational psychologist will be the efficiency engineer.

Educational psychology has in the past been, all too often, merely an explanation of educational procedure, or, on the other hand, mere consideration of rules of procedure without reference to psychological facts. The efficiency engineer in educational psychology faces a different problem. He will be employed by educational agencies to determine needed psychological facts and to direct their application.

C. E. S.

NOTES AND NEWS.

Students of immigration problems will be interested in the work that the Training School at Vineland, N. J., through its Department of Research, is carrying on at Ellis Island. It will be remembered that in May and in September, 1912, experiments were made at Ellis Island to determine the percentage of defectives among entering immigrants. This was done and has been reported in the *Training School* for December, 1912 (Vol. IX, No. 7 and 8, page 109), this report embodying also the statistics of foreign-born defectives now in American institutions for feeble-minded. The experiment that is now being conducted is a more extended investigation of the work done at that time. There are in the main three purposes: (1) to see whether or not persons of considerable experience in institutions for the feeble-minded can and do have the ability to pick defectives at sight, just as the Island physicians pick out cases of insanity or of disease; (2) to determine whether or not the Binet Scale is a suitable instrument for measuring the native intelligence of aliens; and (3) to find from extended investigation what percentage of entering immigrants are defective, and if possible, what foreign sections supply the largest amounts of defectives.

To this end two of the staff of the Department of Research of the Training School (Misses Bell and Moore) have been established at Ellis Island for several months' experimentation. They will stand on the inspection line and attempt to point out those who in their opinion are feeble-minded. These will then be examined by the Binet Scale and from the results obtained there will be gained information of considerable value concerning the three hypotheses.

The Juvenile Protective League of Minneapolis has undertaken a physical and mental study of the boys and girls that get into the Juvenile Court, with the purpose of following them up for a number of years, and ascertaining the precise effect of remedial treatment. Dr. Harris D. Newkirk, a specialist in children's diseases, has been engaged for a five-year campaign, and will follow up and secure treatment for all of those needing medical attention, while Dr. J. B. Miner of the University of Minnesota is selecting and devising mental tests to supplement those of Binet and Healy for a detailed study of the delinquents' mental ability. The question at issue is to what extent, under the most favorable physical conditions, can the delinquent boy or girl profit by special training?

Dr. Fred Kuhlmann, director of research at the State School for Feeble-Minded at Faribault, Minn., has been giving a course in mental retardation at the University of Minnesota the past semester. Dr. Herbert Woodrow, who began this course in 1909-1910, also has a class in the same subject this year. The clinic in mental devlopment, organized in 1909-1910, in connection with other examinations made at the Juvenile Court, occupies about two days a week, and on the psychological side is under the direction of Professor J. B. Miner, assisted by Drs. Woodrow and Kuhlmann. The medical examinations are in charge of Dr. J. P. Sedgwick of the department of pediatrics.

The annual report of the Seattle Juvenile Court for 1912 is an interesting document and raises some important questions regarding the treatment of juvenile delinquents. A Department of Diagnosis has been introduced and the director of this department does valuable work in sifting the cases that come before the judge, and in making suggestions as to treatment or procedure. Both the judge and the director express themselves strongly against indiscriminate probation, on the ground that many of the offenders are physically, mentally or socially so handicapped that probation simply throws them back into temptations which are already manifestly too strong for them. More discrimination, more careful study of each individual case is the great need.

A conference on the conservation of human life will be held at Reed College, Portland, Oregon, May 9-11, 1913. Among the topics for discussion are found: Organized efforts to abolish child labor, to improve country life conditions, to better the conditions of juvenile offenders and other defectives, and to promote school hygiene, playgrounds and recreation centers.

Dr. Eleanor H. Rowland of Reed College, Portland, Oregon, is conducting a series of psychological tests on all of the upper classes of Reed College partly for the purpose of measuring the correlations between their rank in these tests and their ability in college subjects, and also the correlation between the results of these tests and their fitness for admission to college, so far as this is indicated by the evidence obtainable. The tests include: (1) Memory (visual, auditory, articulatory); (2) association (controlled and uncontrolled); (3) association (computation test); (4) apprehension; (5) cancellation; (6) attention control; (7) line length discrimination; (8) heat experiment (ability to perceive slight differences); (9) linguistic invention; (10) situation test; (11) logical memory.

The Educational Laboratory at Cornell University will conduct a series of tests under the direction of Professor Whipple to de-

termine the mental status of selected cases in the George Junior Republic at Freeville, N. Y. If the results warrant the step, future applicants for admission to the Republic will be given a psychological as well as a medical examination.

The address delivered by Professor Stern of Breslau at the Berlin Congress of Psychologists last year has been published in much enlarged form as a monograph. An English translation by Professor Whipple is now announced to appear within a few months, in the Monograph Series connected with this Journal, under the title: "The Psychological Methods of Testing Intelligence and Their Application to School Children."

America will soon have an unusual opportunity to find out just what the world-wide health movement of the twentieth century really amounts to in the field where its influence is most felt—in the schools. The International Congress on School Hygiene, to be held at Buffalo, N. Y., August 25-30, will be an international summing up of recent achievements in the hygiene of the school. The congress is international and national. Practically every foreign country and every State in the United States will be represented by delegates. So far all the States but Oklahoma, Arizona, Missouri, Alabama, Maine, Florida and Kansas have been heard from favorably. It is estimated that at least 8000 delegates will be in attendance, 3000 of them from abroad. Many of the most prominent scientists and educators in this and foreign countries have promised to present papers and lead discussions at the meeting. A preliminary program of the congress has been issued, copies of which may be procured from the United States Bureau of Education at Washington, or from Dr. Thomas A. Storey, secretary-general of the congress, City College, New York City.

In accordance with the plan outlined by Mr. Kirkpatrick of Fitchburg, Mass., photographs of psychologists are being secured. Copies of a uniform size of eight by ten will be made. Mr. Kirkpatrick does not attempt to decide whose pictures should be included in the series. He will have negatives made only of those asked for by a sufficient number to justify it. Anyone desiring pictures of certain men should therefore notify him at once. The call for pictures of philosophers, educators and scientists is, up to the present time, slight and scattering as compared with that for psychologists. Autographs will probably accompany the pictures.

At the eleventh annual meeting of the Brown University Teachers' Association, held at Providence, R. I., March 28 and 29, one session was devoted to the general topic of "Greater Flexibility in College Entrance Requirements," the other to "The Eye and the Printed Page." The papers, which will be printed in the May num-

ber of *Education,* included in the first session: "The Needs of the High Schools," by Superintendent W. H. Holmes of Westerly, R. I.; "The Attitude of the Colleges," by Professor H. B. Huntington of Brown University, and "The New Harvard Plan," by Professor H. N. Davis of Harvard University, and in the second session: "Eye Movements in Reading," by Professor G. M. Whipple of Cornell University; "The Right Way to Read," by T. H. Briggs of Teachers College, Columbia University, and "How Students Actually Read," by Librarian H. L. Koopman of Brown University.

Professor J. B. Miner, head of the Department of Psychology in the University of Minnesota, has been granted leave of absence for next year, and will sail for Europe the last of June. He will make a special study of problems of delinquency and mental development.

Superintendent J. H. Phillips of Birmingham, Ala., has arranged a course of lectures in ten centers on child health and hygiene. The lectures are delivered by physicians who are specialists in their lines and are designed for the instruction of mothers in the care of children.

Professor W. C. Reudiger has been appointed Dean of the Teachers College at the George Washington University. He has been acting dean since the death of Dean Hough last September.

PUBLICATIONS RECEIVED TO MARCH 1, 1913.

(Notice in this section does not preclude a more extended review.)

GEORGE V. N. DEARBORN. *The Promotion of Efficiency. II. A Contribution to the Physiology of Kinesthesia.* Reprinted from the Journal für Psychologie und Neurologie, Bd. 20, H. 1-2, 1913. Pp. 62-73.

An interesting experimental study in the drawing of line figures after the subject had been blindfolded and the hand holding the pencil had been guided over the figure by the operator. Deliberate attention shortens the movements and diminishes the angles between them.

ELSA DENISON. *Helping School Children.* New York: Harper & Bros, 1912. Pp. xxi, 352. $1.40 net.

This study by a member of the New York Bureau of Municipal Research discusses in detail a number of suggestions for efficient co-operation with the public schools. Among the means for such co-operation are private giving for the relief of those in distress, publicity through the press, parents' organizations, women's clubs, medical and dental clinics, the church, and business men's organizations.

CHARLES A. ELLWOOD. *Sociology in its Psychological Aspects.* New York: D. Appleton & Co., 1912. Pp. xiv, 417.

A well-organized, closely-reasoned study of the manifestations of human thought and action in social relationships. Psychologists are laying increasing stress on human behavior, and the behaviorist will here find the most important recent contributions to social theory subjected to critical and constructive analysis. It is an extremely valuable book for thoughtful teachers.

Final Report of the National Committee of Fifteen on Geometry Syllabus. Reprinted from Mathematics Teacher, V No. 2, December, 1912. Pp. 88. To be obtained gratis on request to the Bureau of Education, Washington, D. C.

Principals and superintendents should see to it that this monograph is in the hands of every teacher of geometry. The first thirty pages give a bibliography of the subject and a brief account of the methods of procedure in France, Germany, Italy, England, and the United States. Then follows a discussion of axioms, definitions,

informal proofs, place of geometry in the curriculum, and the purpose of the study of geometry. Investigators in the field of geometrical reasoning, and of reasoning in general, should be familiar with the report.

DOROTHY CANFIELD FISHER. *A Montessori Mother.* New York: Henry Holt & Co., 1912. Pp. xiv. 240. $1.25 net.

A sympathetic and enthusiastic interpretation of Montessori principles by a mother who had the opportunity of coming into close personal contact with Madam Montessori in Rome. The book is no exception to other Montessori literature in revealing a strong emotional element. "In many ways this Montessori System is a new religion which we are called upon to help bring into the world, and we cannot aid in so great an undertaking without considerable spiritual as well as intellectual travail."

FREDERICK HARRISON. *The Positive Evolution of Religion.* New York: G. P. Putnam's Sons, 1912. Pp. xx, 267. $2.00.

In this book the great apostle of Comte's Positivism summarizes his whole philosophy, and gives us a systematic study of the entire religious problem. "Education would be a more significant and precise phrase to use of Positivism, if we could purge education from its purely intellectual connotation, and took it to mean the training of the heart, of the emotions, of the character, of conduct, in public and in private, as well as the training of the understanding —if we could get rid of the pitiful superstition which limits the meaning of education to the passing successfully a series of examinations. Positivism is at once a scheme of education, a form of religion, a school of philosophy, and a phase of socialism."

WILLIAM H. HOLMES. *School Organization and the Individual Child.* Worcester, Mass.: The Davis Press, 1912. Pp. 197-211. $2.00.

"The present volume undertakes the task of presenting in a somewhat detailed manner the various plans that have been evolved to make school organization fit the needs of the boys and girls both normal and abnormal that are enrolled as pupils in the public schools." It contains much interesting and valuable material put in compact and convenient form. Part I treats of normal children, and contains chapters on various plans of classification and promotion, the training of teachers, speech defects, and the Montessori methods. Part II deals with subnormal children, contains a study of special schools and classes in the United States, gives the only English translation of Vaney and Binet's tests of instruction, and makes available much important material in appendices.

M. A. Leiper. *Latin Subordinate Clause Syntax.* New York: The American Book Company, 1913. Pp. 55. 30 cents.

The number of all subordinate clauses in four books of Caesar and six orations of Cicero is given as well as their classification.

Jacques Loeb. *The Mechanistic Conception of Life.* Chicago: The University of Chicago Press, 1912. Pp. 232. $1.50 net.

The ten papers reprinted here from various sources give a popular presentation of the results of the author's researches in biology. One of the most interesting of these studies is the last, treating of the influence of the environment on animals. The most recent experiments upon the subject seem to have furnished proof that external conditions can cause hereditary changes in animals.

William Henry Pyle. *The Outlines of Educational Psychology. An Introduction to the Science of Education.* Third and enlarged edition. Baltimore: Warwick & York, Inc., 1913. Pp. ix, 276. $1.25 net.

The popularity of Pyle's *Outlines* is evidenced by the rapidity with which new editions are demanded. The simplicity and clearness of its style, the detailed references, the questions and topics for further study make the book well adapted to the needs of the most immature students, while the more advanced will find much to stimulate reflection. The emphasis on instincts and habit formation lays the foundation for any subsequent discussion of the educative process. The present edition contains several amplifications, chief among which is a chapter on thinking—a phase of mental activity which was somewhat overlooked in the earlier editions.

S. Bent Russell. *A Practical Device to Simulate the Working of Nervous Discharges.* Reprinted from the Journal of Animal Behavior, Vol. 3, No. 1. January, 1913. 15-35.

With the growth of interest in the study of human behavior comes the desire to represent in some intelligible fashion the action of the nervous system which controls that behavior. The device described here shows an interesting analogy between the action of inanimate materials and that of the human nervous system.

Julius Sachs. *The American Secondary School and Some of its Problems.* New York: The Macmillan Company, 1912. Pp. xviii, 295. $1.10 net.

Any consideration of the problems of the high school must involve a discussion of the status and activities of the teacher, and to this topic the first and perhaps most interesting part of the book

is devoted. The American high school teacher is far behind the European secondary teacher both in knowledge of subject matter and in the technical training for the profession of teaching. The reasons for this and the direction in which betterment must be sought are cogently pointed out. The second part deals with the present status of the public high school, the private secondary school, and the educational policy of the secondary school. There are two excursuses and an appendix.

MARGARET SLATTERY. *A Guide for Teachers of Training Classes.* Boston: The Pilgrim Press, 1912. Pp. ix, 130. 50 cents net.

This little manual was designed to assist those who "undertake the task of preparing young men and women chosen from the senior classes in the Sunday School to be the future teachers of that school." It contains sensible advice on the organization and conduct of classes, some reference to recent books on psychology, and a series of bible lessons.

CHARLES STELZLE. *American Social and Religious Conditions.* New York: Fleming H. Revell Co., 1912. Pp. 240. $1.00 net.

This little book contains a mass of statistical information on problems of city and country life, the liquor question, the immigrant, the negro, the Indian, and the relations of the church to the social problems and conditions of modern life.

LEWIS M. TERMAN. *The Teacher's Health.* Boston: Houghton Mifflin Co., 1913. Pp. xiv, 137. 60 cents net.

An admirable pioneer work on a most important topic. There are few callings in which more exacting demands are made on the nervous force and vital energy of their followers than in teaching, yet little thought has been given to the physical equipment of the teacher or to the conservation of his vitality. This book "summarizes and interprets the most important investigations which bear upon the hygiene of the teaching profession." It treats of the mortality and morbidity of teachers, tuberculosis, neurasthenia, the margin of safety, makes suggestions for physical, mental and moral hygiene, and indicates the responsibility of the normal school.

VOLUME IV May, 1913 NUMBER 5

THE JOURNAL OF EDUCATIONAL PSYCHOLOGY

THE PROBLEM OF SEX EDUCATION.

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The Public Interest. One of the few things upon which educators are agreed is that children should be instructed in matters of sex. For several years past this question has been receiving increasing attention in educational and sociological publications, and its importance is being more and more stressed. This does not necessarily mean that vice and venereal disease are growing, for the contrary may be the case. But it does mean that through research the results of the social evil and its accompaniments have been traced out; that this information has been disseminated, and that a more sensitive public conscience than of old has been quickened to meet the long-standing demands of the situation. Laymen everywhere, and especially parents, will follow the struggle with this problem with as keen an interest as they will regard anything of an educational nature.

Disagreement As to Methods. But as soon as one has observed that there is agreement on the need of sex instruction, he must pause. For there is utter absence of accord when we come specifically to ask who shall give this instruction; where, when and how he shall give it; and finally what shall be given. To the writer it does not seem rash to predict that in four or five decades we may be offering what is needed, and doing it effectively, through more than one avenue, by various methods, at divers times and places. But just now Babel reigns. Some say the work must be done by the parents;

others declare that the agency must be free literature spread broadcast, or classes conducted by physicians or other specially-equipped persons; still others will place this new duty upon the regular teacher in the public school. Some would develop it out of nature study in the grades; others would approach it *via* the high school classes in biology, and a few would cut the Gordian knot off short at what they consider the appropriate time without "approaching" it at all.

No Scientific Data for Judgment. While we flounder in this uncertainty, amid nearly as many opinions as there are holders of opinion, it may be permissible for one who, as high school principal for several years had the seriousness of the sex situation called repeatedly to his attention, to offer his views. They are largely theoretical, in small measure empirical, which clearly classifies them with about everything we have on the subject. Actual experimental evidence on this point will accumulate very slowly, since the experimenter cannot complete his test in a month, check it by a "control" group and publish his "per cents." in a forthcoming periodical.

A Fundamental Requirement. Now, if the first requirement is that *sex shall be taught,* the range of possible teachers is lessened. Those who contend for the primacy of the home are holding to an ideal which all admire, but which is merely an ideal and utterly impractical in our generation, though it may not always be so. As society's demands multiply we are finding that there is scarcely anything that the home can be trusted satisfactorily to perform. One by one the various arts, intellectual and manual, have been rescued from domestic neglect or incapacity and transferred to the school. When we put the proposal to actual test, the home cannot be relied upon to teach sex. In some homes morals are loose or lacking, though this is comparatively infrequent. Millions of strictly moral parents refuse on flimsy pretexts to shoulder any responsibility, and many of the remainder are unable to teach sex any more than they can teach algebra. Free literature cannot meet the need; it finds the field already well filled with quack literature and advertisements within reach of boys especially. Occasional institutes or lectures do not reach the

masses. The school is the only organized agency that touches all the children, and only through it, by regular or special teachers, can we assure ourselves that *sex shall be taught.* No parent is thereby barred from co-operation in dealing with his child. All other suitable and reputable agencies may enter the field.

A Second Requirement. Educational history bears witness that much teaching has been a ridiculous waste—mere lessons, formally studied and perfunctorily recited. In this age the light of inquiry is being turned on every element of every new and traditional subject in the curriculum, and the question is always, "How does it affect the later life of the pupil?" When we look around we discover that hygienic instruction has failed to slump the tea or coffee market or "bust" the beer or tobacco trusts. It is therefore not enough that simple facts of sex shall be imparted, but *these facts must be given in a vital, dynamic way.* This emphasizes more than ever the need that the work shall be done by those who understand the nature and development of childhood and youth, and who know how to break through that reserve and sense of difference that unfortunately grows up between most children and their parents, culminating more or less unhealthily at adolescence.

An Unpedagogical Approach. Just what constitutes vital and effective method is not so simple to agree upon. But in the light of general pedagogy certain principles ought to stand out plainly. There is widely current an idea to the effect that the notion of sex difference and its place in nature can be gradually developed through many phases of nature study, such as the process of pollination in plants, the depositing of eggs and storing of food for the young by many insects, the nesting habits of birds, etc. Though no one has stated it precisely, doubtless it is expected to work from the oviparous to the viviparous idea, and finally up through the mammals to the constitution and purpose of the family as a human group. No one will object to the educative effect of such a training, but that it should be conceived as a pedagogical method of attacking the sex problem is beyond many.

No Need of An Approach. The technical purpose of a

method is presumably (1) to widen the scope of a child's interest by indissolubly connecting with some old interest something not hitherto of interest, and (2) to raise a problem in the child's mind. Now, neither of these two ends can be well achieved by the proposed method, because the problem of sex is in the normal child's mind before he reaches the fourth grade, and the only reason why we hear so little of it during his pubescent years is because it has been crowded into the background by other active interests and by the repeated rebuffs with which his attempts to investigate have been met. And then, why should we advocate a long and, to the child, a tortuous approach to this absorbing interest? We do not hear it argued that the hygiene of breathing involves a study of the function of spiracles in grasshoppers, or gills in fish. No one thinks the hygiene of eating may be better taught if preceded by a study of the organs of prehension and mastication far down in the animal scale. Such work is entirely educative, but quite superfluous with respect to the ultimate end.

Danger of the Slow Approach. But there is a positive danger in the indirect method of approach, because the teacher has not had the courage, from the child's standpoint, to attack the problem directly. If the boy, as is very likely, has already had information or misinformation of sex matters through the spoken or written word or the action of his older boy associates, he is exceedingly quick to note what he considers a stealthy, because gradual, introduction of a subject which he has been told to discuss "only with the fellows." Hence his suspicions are aroused and strengthened instead of being disarmed; now he is sure there is a "skeleton in the closet." But the term *introduction* is a misnomer if the child has already had his introduction, and such is almost inevitable before he reaches the age at which the school is able to generalize the idea of sex.

The Scientific Attitude Toward Sex. A yet more fundamental error inheres in this idea of generalizing sex through nature study or later in high school biology, *i. e.*, an error of efficacy in sex instruction. All attempts to denude sex of all feeling, to disemotionalize it, are, in the writer's opinion,

doomed to failure. If scientific knowledge of the effect of narcotics cannot prevent numbers of our physicians from becoming "dope fiends," who will have the hardihood to claim that in a high school laboratory an adolescent can learn enough about sex to control his conduct thereafter? This is because emotion is more basic than mere information in determining ethical living. The latter leads to judgment, but the former impels to action; and the most casual observer can multiply illustrations of this principle to his satiety. Sex feelings are universally admitted to be instinctive, and, according to no less an authority than McDougall, have an unvarying, inseparable emotional correlate. It is possible that a considerable number of physicians after long experience are able to assume a *comparatively* unemotional attitude toward sex, but that children may be given a cold, scientific or intellectual regard for sex or anything else equally prominent in the evolution and survival of the race is chimerical. Nature does not leave such important matters to human reflection or judgment. Sterilization by education is impossible.

Emotions vs. Emotions. Like most contemporary writers on educational topics, the present writer finds his easiest task in telling how not to do it. Still, he would be false to his convictions if he closed without a few positive suggestions. The subject under discussion can be treated to advantage only by starting a back-fire against the impulse to sexual carelessness. The reproductive instinct is not so strong as instincts tending to self-preservation; the amorous emotion (in its unsocial manifestations) can be conquered by fear, disgust, self-respect and desire for the regard of others. If a skillful principal wants to decrease the use of cigarettes among his boys, he will not attack the practice necessarily through the physiology class, and certainly not from the physiological side alone. So in sex instruction we must seize on motives whenever and wherever we come upon them. No matter what the motive; if it *is* a motive, it can be made to count.

The Teacher of Sex. He who is called to the high work of instructing in this momentous subject should be no ordinary mortal. He must know his subject, and he must also know his pupils, the springs to their conduct, what attracts and what

repels. He must be able to command their confidence by his fairness and frankness and burning interest in what he is to impart. No apologist can for one moment succeed. Many a parent can do this excellently if he will. Most teachers ought to be able to do it, for their own sex at least, if they really possess those qualities which should make teachers the most useful of the world's men and women.

When Shall We Begin? That high school pupils are peculiarly ripe for this instruction is almost a truism, (1) because of the new dangers that are characteristic of their physiologic age, (2) because of their emotional susceptibility. If the State has a right to prescribe anything for every high school student, it should begin here. It is true that only one-fifth to one-twentieth of the children in different communities are graduating from the high school, but many others attend for a time, and the proportion is constantly increasing. If these can be reached at their peculiarly propitious age, there will soon be in every group of boys and girls almost anywhere one or more whose spirit shall have been stirred and whose ideals lifted up. And all such will become teachers of their less-favored fellows.

Still, there may be no impropriety, and possibly much wisdom, in carrying the gospel down into the grammar grades. The trouble comes in administration. Ideally, the writer believes there should be some differentiation on the basis of age between those under and those over 14. But then arises the difficulty of making the younger pupils feel that they are being dealt with frankly. Few of those below this limit are likely to profit by much instruction. At least, we shall all agree that there is some inferior age or grade limit to be set for sex instruction, though there probably should be no inferior limit set to the truthful, but guarded, answering of honest spontaneous questions from the children. The only way to establish our limit intelligently is to start in at the top of the school and work carefully down, surely not the reverse.

What Shall Be Taught? Sex instruction should not be stingy. Boys and girls have the same right to the vital facts here that they have to the vital facts in science, literature and history. Pubescents should be content with the names of vene-

real diseases, their visible effects and means of avoiding innocent infection. Such are the matters covered in the elementary school with reference to other contagious diseases. Adolescents in the grades should understand plainly how human life is transmitted, the culpable as well as the innocent methods of contracting venereal disease, the invisible and permanent results of the scourge and the effect of solitary vice. High school students before the end of their course would take the keenest sort of interest in the larger social aspects of these questions. A half-year course in "Social Problems" could advantageously be outlined, to be distributed in biweekly sessions over the entire four years, starting from the facts already imparted in the lower school and studying them in a more detailed way in relation to the physical and moral welfare of the individual. Next might come the evils of prostitution, the means adopted for their control and alleviation, the relation of licensed vice to municipal government and to other forms of crime, pandering and its detection and punishment. There should be a sociological (not a biological) study of the present status of the Lamarckian-Weismannian controversy and a careful consideration of devices for turning the principles of heredity to account in the treatment of criminals, lunatics, defectives, paupers and other delinquents and dependents. The end should be an appreciation of eugenics and its field. There is already available a vast amount of literature well adapted to the purposes of such a course, and well-chosen readings from this field should be in reach of all who are interested.

Coeducation or Segregation? The relation of the sexes in school is necessarily to be settled in connection with this teaching, and no doubt in different ways at different points along the route and according to the material presented. The regular force of teachers should be able to handle the instruction with less reserve or embarrassment, and they should get nearer to the pupils than special teachers. This can be easily managed along with sex segregation as far down in the system as departmental teaching goes. For children below the grammar grade segregation should hardly be necessary. The progress made in free and easy treatment of the subject will

determine largely how far coeducation can be carried. The further it can be followed with due delicacy the better will be the voice of those who approve coeducation as a general principle. If *none* of the topics suggested above can be treated by either men or women teachers before a mixed class of high school pupils, there has been a serious defect down the line somewhere.

An Objection from Abroad. Those who are alarmed at the possible effect of "Europeanizing" our educational treatment of the sex relation have overlooked the fundamental distinction between making the idea of sex too *common* and stimulating a *natural* attitude toward it as opposed to the present unnatural attitude. And even if it be admitted for the sake of argument that sex knowledge is imparted at a much earlier age abroad than it is here, and that it is made exceedingly common, it is a hasty sort of logic which paints existing or supposed conditions in foreign lands as a result of this knowledge. When we consider the greater density of population and stress of economic conditions abroad (factors which practically always are promotive of crime and vice), the historic inferiority of woman's position and vise-like grip of old national ideas, the dissimilarity and advantage of the New World are unmistakable. But, admitting also the validity of the conclusion that present conditions are wholly the outcome of different attitudes toward sex on the two continents, the argument of danger still fails; for the moment we consult comparative statistics of crimes against persons, sexual or otherwise, statistics of venereal disease, prostitution, divorce and intemperance, the conclusions come inevitably that somehow we have failed to realize our national advantages. The day is past when in a moral sense we may hold up the Old World as a "horrible example."

THE RESULTS OF GRADING THIRTEEN HUNDRED FEEBLE-MINDED CHILDREN WITH THE BINET-SIMON TESTS.

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The results reported in this brief account are on points that have been frequently discussed in this and other periodicals.* It is hoped that they may contribute something further on some of the more fundamental questions concerning the Binet-Simon tests. The method of treating the statistics here followed has not been employed heretofore, to my knowledge, in analyzing the results of a large number of examinations. The data may have a further interest in that the examinations of these 1300 children were all made by one person, the writer, thus eliminating the variable, personal factor of different examiners, which seems to have been responsible for considerable disagreement among different writers who have used the tests and obtained conflicting results.

A. Accuracy of the Individual Tests. Since it is not assumed in the Binet-Simon system that each individual test will always give exactly correct results, but only in a certain high percentage of instances, it is of the first importance to know just what this percentage of accuracy is for each test. Are the tests arranged in a series of increasing difficulty for the normally developing child, so that each test belongs in the age group in which it is found, and in no other? The best answer to this question should be given in the results with normal children of the different chronological ages. But since

*A fuller account will be found in the following: "The Present Status of the Binet-Simon Tests of Intelligence of Children." Jour. of Psycho-Asthenics. March, 1912; "The Binet and Simon Tests in Grading Feeble-Minded Children." Ibid, June, 1912; "A Revision of the Binet-Simon System for Measuring the Intelligence of Children." Ibid, Mondgraph Supplements, September, 1912.

such results assume the exact normality of the children chosen for this purpose, we can approximate accuracy only to the degree in which this assumption is correct. We can, however, determine the relative degree of difficulty of the individual tests without involving this assumption, and we may also determine in the same way whether any given test belongs in the age group in which it is placed rather than in a higher or lower age group. In the present study we have first treated the tests in each age group by themselves, and found the percentage of the number of times each test in an age group was passed by all the children that took that test, irrespective of the chronological or mental ages of these children. These percentages, then, indicate the relative degree of difficulty, for feeble-minded, of the individual tests in that age group. We next selected those tests that appeared relatively quite easy or quite difficult for their age groups and found what children of different mental ages, according to the system as a whole, did with these tests. If test VI-2, for example, is much more difficult than others in age group VI, what percentage of the children with a mental age of seven will pass this test? To avoid certain sources of error involved in using the results of feeble-minded children in this way, certain classes of children were eliminated. These are (1) the epileptic, (2) those with special sensory defects, chiefly deafness; (3) those with any serious motor disturbance, chiefly paralysis and choreiform movements; (4) children from whom, from a variety of different causes, the best responses they seemed capable of were not obtained. After these eliminations there remained 1006 cases.

In Table I the Roman numerals indicate the age groups of tests. The Arabic numerals, running 1, 2, 3, etc., indicate the individual tests in each age group. The numbering is that given in Goddard's account of the 1908 series of tests in the Training School and in my account of them in the Journal of Psycho-Asthenics, 1911. The large numbers immediately to the right of the Roman numerals are the number of children who took all the tests in the corresponding age groups. The numbers with the preceding plus and minus signs give the variations from the average per cent. with which all the tests

of an age group were passed, the signs indicating the direction of the variation. For example, test III-1 is relatively easy for its age group, the 21 being the difference between the average per cent. with which all the five tests in age group III were passed and the per cent. with which test 1 was passed by the 395 children. The figures in "black" type indicate the larger variations, showing the tests that are relatively quite easy or quite difficult. For these tests further results are given in Table II.

TABLE I.

I-II 255						III 395					IV 365			
1	2	3	4	5	6	1	2	3	4	5	1	2	3	4
+15	+12	+10	+6	−10	−35	**+21**	−17	−1	−4	0	+12	+17	−16	−11

V 526				VI 515							VII 469				
1	2	3	4	1	2	3	4	5	6	7	1	2	3	4	5
+5	−4	+1	−3	+7	**−30**	+10	**+20**	−3	**−24**	**+22**	**+18**	−3	+5	**−22**	**−18**

VIII 403							IX 274						
6	7	8	1	2	3	4	5	6	1	2	3	4	5	6
+14	+13	−5	−15	−11	**+36**	−14	+1	+5	+16	**+43**	**−22**	−19	−16	−2

X 172					XI 108					XII 53				XIII 27		
1	2	3	4a	4b	1	2	3	4	5	1	2	3	4	1	2	3
+23	**+26**	−17	+1	**−32**	+6	+18	−2	−11	−10	−6	+13	**−23**	+14	+6	−18	+6

A test might be relatively easy or difficult for its age group and yet not vary enough from the others in its group to require shifting into another age group. The results in Table II are intended to help decide this question. In this table the Roman numerals refer again to the age groups. The Arabic numerals with the plus and minus signs following give the individual tests, the signs indicating whether they are relatively easy or difficult, according to the figures in Table I. The second horizontal column gives the mental ages of the children. The last horizontal column gives the number of children under each mental age and the percentage of this number that passed the test in question. Thus, in test III-1, 57 per cent. of the 129 children with a mental age of two passed test III-1; 98 per cent. of the 65 children with a mental age of three passed this test. The figures in the "black" type in this table indicate the tests which, according to these results, vary so much in relative ease or difficulty from the others in their

age group that they require shifting into another age group. These are nine in number, a few of which probably need a shift of more than a year.

TABLE II.

III 1+				VI 2−				VI 4+				VI 6−			
2		3		6		7		5		6		6		7	
N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
129	57	65	98	124	20	114	42	110	53	147	93	135	30	109	50

VI 7+				VII 4−				VIII 3+				IX 2+			
5		6		7		8		7		8		8		9	
N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
118	53	153	86	115	43	73	77	117	88	96	98	68	96	45	98

IX 3−				X 1+				X 2+				X 4b				XII 3−			
9		10		9		10		9		10		10		11		12		13	
N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
42	40	33	61	42	95	35	100	41	90	36	100	34	38	18	72	7	24	3	67

The results with the feeble-minded also offer opportunity to obtain evidence on the much-discussed question of the effect of age and training on the accuracy of the tests. It has been observed that the adult feeble-minded can do many more things than the younger normal child of the same intelligence, because the former has had so much more time to learn to do various things. Are the tasks the children are required to do in these tests affected in the same way? The data given in Table III indicate that the effect is not large enough to cause serious inaccuracy from this source. For this table the children are first classified into chronological age groups of 6 to 10 years, 11 to 15 years, etc., as shown in the first vertical column on the left. The remaining figures are obtained in the same way in this table as in Table I. Test III-1, for example, is easier than the average of the five tests in this age group for children chronologically 6 to 10 years old, as indicated by the + 15. It is easier still for children chronologically 11 to 15 years old, as indicated by the + 27, thus possibly showing some influence of age and training. A corresponding decrease in the figures preceded by the minus sign as the chronological age increases means, of course, the same thing. For those tests for which the figures could be at all interpreted as showing an influence of age and training the figures are put in "black" type again. The conclusion that this table leads to is that there seems to be some influence of age and training

for a number of the tests, but for nearly all of these it is hardly large enough to make the test too easy for its age group in the case of the older children unless it was already relatively easy for the younger children.

TABLE III.

	III					IV				V				VI	
Age	1	2	3	4	5	1	2	3	4	1	2	3	4	1	2
6-10	+15	−13	+3	+7	−11	+10	+19	−25	−4	+9	−10	+7	−6	+4	−30
11-15	+27	−12	0	−1	+4	+19	+12	−19	−14	+11	−5	+2	−8	+7	−31
16-25	+21	−15	−3	−6	+2	+10	+19	−17	−11	−3	0	+7	−2	+6	−34
16+	+22	−18	0	−6	+1	+8	+17	−3	−3	+4	−3	−3	0	+8	−27

	VI					VII							VIII	
Age	3	4	5	6	7	1	2	3	4	5	6	7	8	1	2
6-10	+6	+13	+3	−15	+18	+40	+2	0	−33	−25	+18	+19	−25	..	..
11-15	+10	+16	0	−19	+19	+20	−2	+11	−19	−27	+10	+12	−2	−24	−7
16-25	+10	+19	−3	−19	+19	+18	−2	+5	−19	−19	+11	+10	−5	−20	−12
26+	+12	+30	−3	−19	+19	+8	−5	−2	−26	−10	+19	+16	−4	−6	−16

	VIII				IX						X				
Age	3	4	5	6	1	2	3	4	5	6	1	2	3	4a	4b
11-15	+43	−14	−3	+3	+10	+37	−22	−16	−13	+11	+19	+28	−2	−3	−43
16-25	+36	−14	+3	+4	+17	+45	−19	−20	−21	−1	+13	+19	−25	+17	−23
26+	+26	−15	+3	+5	+18	+46	−24	−19	−11	−9	+29	+25	−24	+4	−32

B. Needed Revisions. My experience with the Binet-Simon tests has led me to about the same conclusions as regards needed revisions as have already been pointed out by others, but perhaps with a considerable difference as to the relative importance of these different revisions. I should place the more important ones in the following order:

a. The tests need first of all a more complete standardization as regards just how each test is to be given and how the children's responses are to be interpreted.

b. Several of the tests need to be shifted to other age groups or dropped entirely and new ones supplied in their places.

c. The scale should be extended at both ends; extended and supplemented with more exacting tests at the upper end, and extended downward at the lower end to include the smaller mental ages below three years.

d. The number of tests should be the same for each age group.

C. A Revised List. In my revision the chief endeavor has been to supply as complete as possible a standardization of the procedure in giving the tests and in interpreting the responses obtained. This cannot be summarized here. The extension and supplementing of the upper end of the scale is left for a future report. The changes made in regard to the other points mentioned may be seen in a general way from the following revised list of tests:

Age Three Months.

1. Carrying hand or object to mouth.
2. Reaction to sudden sounds.
3. Binocular coördination.
4. Turning eyes toward light in marginal field of vision.
5. Winking to an object threatening the eyes.

Age Six Months.

1. a. Balancing head. b. Sitting.
2. Turning the head toward source of a sound.
3. Opposing thumb in grasping.
4. Prolonged holding of objects placed in hand.
5. Reaching for seen objects.

Age One Year.

1. Sitting and standing.
2. Speech.
3. Imitation of movements.
4. Marking with a pencil.
5. Recognition of objects.

Age Two Years.

1. Pointing out objects in a picture.
2. Imitation of simple movements.
3. Obeying simple commands.
4. Copying a circle.
5. Removal of wrapping from food before eating.

Age Three Years.

1. Enumeration of objects in a picture.
2. Comprehension of simple words.
3. Giving the family name.
4. Repetition of a sentence of six syllables.
5. Repetition of two numerals.

Age Four Years.

1. Giving sex.
2. Naming familiar objects.
3. Repetition of three numerals.
4. Comparison of two lines.
5. Discrimination of forms.

Age Five Years.

1. Counting four pennies.
2. Copying a square.
3. Comparison of two weights.
4. Game of patience.
5. Repetition of a sentence of ten words.

Age Six Years.

1. Distinction between right and left.
2. Aesthetic comparison.
3. Definition according to use of object.
4. Execution of three simultaneous commands.
5. Distinction between morning and afternoon.

Age Seven Years.

1. Description of a picture.
2. Naming four common pieces of money.
3. Telling number of fingers.
4. Recognition of multilations in pictures.
5. Repetition of five numerals.

Age Eight Years.

1. Copying a diamond.
2. Naming the months of the year.
3. Counting the value of stamps.
4. Counting backwards from twenty to one.
5. Comparing two objects from memory.

Age Nine Years.

1. Naming nine pieces of money.
2. Giving the date.
3. Definition better than according to use.
4. Making change.
5. Arrangement of weights.

Age Ten Years.

1. Counting dots.
2. Comprehension of easy questions.
3. Drawing a design from memory.
4. Using three words in a sentence.
5. Form board puzzle.

Age Eleven Years.

1. Recognition of absurdity in absurd statements.
2. Giving sixty words in three minutes.
3. Giving definitions of abstract words.
4. Words to put in order to make a sentence.
5. Giving the numbers to the parts of a form.

Age Twelve Years.

1. Repetition of seven numerals.
2. Rhyming words.
3. Repetition of one sentence or more with twenty-four syllables in all.
4. Problems of diverse facts.
5. Resistance to suggestion.

Age Fifteen Years.

1. Drawing the folds and a cut in a twice-folded piece of paper.
2. Drawing the figure of two juxtaposed triangles.
3. Distinguishing between two abstract terms.
4. Passage to summarize from memory.
5. Telling time if the hands of the clock were interchanged.

THE SLEEP OF SCHOOL CHILDREN, ITS DISTRIBUTION ACCORDING TO AGE, AND ITS RELATION TO PHYSICAL AND MENTAL EFFICIENCY.

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PART III. THE CONDITIONS OF CHILDREN'S SLEEP.

The conditions of sleep may be roughly classified under two headings: (a) the external or environmental, and (b) the internal or individual. Under the former may be considered such matters as the following:

1. *Housing conditions.* Teachers are fairly familiar with the unsatisfactory housing common among the poorer districts of our larger cities where families of all sizes carry on a wretched and squalid existence in dismal tenements of two or three rooms. Few of us, however, appreciate how many children in well-to-do communities are furnished sleeping accommodations which are hardly less pitiably inadequate. There is probably no section of the country where crowding is less common than in our Western States; but of the 2692 children who entered into this investigation only 32 per cent. have a bedroom to themselves, while 16.4 per cent. share the sleeping-room with two other persons and 9 per cent. with three or more.

2. *Ventilation.* Too often the teacher in the better class school takes it for granted that all the world shares her respect for fresh air and the out-of-doors. So little does she know about the home conditions which surround her pupils during the eighteen or nineteen hours when they are not in her charge!

The following table reveals the bedroom ventilation of our 2692 pupils for the different years. The first column shows that the number sleeping practically without ventilation is much larger in the earlier years. Why this marked improvement in ventilation in the later years? We believe it is difficult to account for it, except on the theory that it is the direct result of hygiene instruction in the school.

TABLE IV.—*Ventilation of Bedrooms.*

Age.	No window open. Per cent.	One open. Per cent.	More than one open. Per cent.	Open-air. Per cent.
6	40.6	43.8	12.5	3.1
7	38	52.5	8	1.5
8	28.5	58.1	9.3	4.1
9	28.4	56.2	12.1	3.3
10	24.6	57.8	14.5	3.1
11	26	56.4	14.5	3.1
12	19.6	63.5	13.6	3.3
13	16.6	62	16.6	4.8
14	10.2	66.6	20.8	2.4
15	14	69	14.6	2.4
16	5.2	67.8	25	2
17	6.5	70.4	18.5	4.6
18	2.5	78	17	2.5

Any teacher who will go to the slight trouble necessary to make a *sleep survey* in her school will probably find enough not only to astonish her, but to give her some valuable suggestions for the teaching of practical hygiene. In this case it was found that 47 per cent. of those sleeping with no windows open were sharing the bedroom with at least two other persons!

Work. Early morning work disturbs the sleep of a large percentage of the school boys in the larger cities. Five per cent. of Ravenhill's boys rose regularly before 5 A. M. for various kinds of work. Of the six-year-old boys, 2 per cent. were engaged in gainful occupations out of school hours. This rose to 28 per cent. at eleven years and to 53 per cent. at twelve.[1]

[1]In our own study the returns on this point were unreliable because of the unfortunate wording of one of the questions. The expression, "hours per week," was evidently overlooked by many of the children, who answered in terms of "hours per day" instead. For the same reason our data on amount of home study proved worthless.

Almost any teacher in city schools above the sixth grade will find, if she takes the trouble to inquire, a certain number of pupils in her class who are engaged in productive labor from 10 to twenty hours per week.

Hours of retiring. Many children secure insufficient sleep merely because they are not put to bed early enough. Nearly 5 per cent. of Ravenhill's six-year-old children retire as late as 10 o'clock, and nearly 10 per cent. of her ten-year-olds. The time lost in this way cannot be fully made up in the morning because of the disturbance caused by the early rising of parents and because of the necessity of getting to school at a given hour. In other words, the hours set apart for the sleep of children are not those best adapted to insure a sufficient amount. Even the families who set a reasonably early hour for the children to retire usually permit so many irregularities that, as one writer puts it, "the law is more observed in the breach than in the performance." Ravenhill found that 20 per cent. at six years and 40 per cent. at thirteen years were allowed one or more irregularities per week. The European custom of beginning school at 7 to 8 o'clock in the morning works great hardship, often causing the pupil to rush away to school in nervous haste and without breakfast. The American practice of beginning at 9 o'clock is far wiser, and should never be changed unless for very special reasons.

Vermin. Medical examiners not infrequently find from 10 to 40 per cent. of the pupils of a school afflicted with vermin. Needless to say, the child who is so tormented cannot secure normal sleep. The reflex nervous irritation produced by vermin disturbs the nutritive functions not only directly, but also indirectly, through its interference with sleep, and teachers need not be surprised when extreme malnutrition and nervousness result from a cause apparently so trivial. Other parasitic diseases, such as scabies, ringworm and intestinal worms, should be mentioned in this connection.

Miscellaneous conditions. The sleep of school children is influenced in many other ways. Temperatures much above 60 degrees are unfavorable either to quantity or quality; and largely for this reason children sleep more in winter than in summer. The late sunrise of winter mornings exerts an in-

fluence in the same direction. Our reflexes are habituated to such delicate response to the stimulus of light that for many of us even a gleam of moonlight through the window disturbs our rest. Humidity and atmospheric pressure are other factors, though their exact effects have not yet been determined.[2]

Other children sleep poorly for lack of a bed and because of inadequate protection from cold. Still others are aroused by the din of early street noises.

Internal Conditions Influencing Sleep.

Improper diet is one of the most important of these. The child's sleep may be disturbed by excess of starchy foods, unsuitable cooking, etc. The late dinner, following an inadequate breakfast and a cold, unsatisfying noon-day meal, favors engorgement of the stomach through excess of hunger, and is also unfavorable to sleep.

The influence of tea and coffee upon sleep is a matter of common observation. The experiments of Hollingsworth (18) on ten men and six women, extending over a period of forty days, verify common opinion on this point, and show that the influence of caffeine is in inverse proportion to the weight of the subject. One cup of coffee for the seven-year-old child is therefore equivalent to three cups for the average adult. Even this may understate the facts, since it is probable that the child's body does not adjust and become habituated to the evil effects of drugs as well as the body of the adult, even in proportion to its size.[3] It is not overstating the facts to say that many hundreds of thousands of school children in the United States are kept in a constant state of semi-intoxication by the use of coffee and tea. The total effect upon sleep and health can only be surmised.

[2]For conflicting evidence on this point see the study of Dr. Caroline Osborne (28).

[3]It is much to be regretted that our own investigation did not undertake to secure data on the relation of sleep to the consumption of coffee and tea. The prevalence of this species of drug habit among school children has, however, been ascertained by Dr. Hoag for the California cities of Pasadena, Berkeley and San Luis Obispo. He finds that the proportion consuming one cup or more per day falls usually between 40 and 75 per cent. for children in the best schools. Occasionally the young child drinks from three to six cups of strong coffee daily.

Other familiar sources of disturbed sleep are obstructed breathing, eye-strain, dentition, earache, toothache, etc.

The nervous child is notoriously a bad sleeper. Such a child is likely to be obsessed by fears, tormented by absurd pangs of conscience, excited by an over-active intelligence, or worried by trivial happenings which would be forgotten by the normal child in a few minutes. Religion-bred fears, fear of the dark and vague indefinable anxieties haunt the evening hours of more children than most of us suspect, for children learn that it is pleasanter to bear many a secret pain and sorrow than to hazard reproof and misunderstanding by imparting them to unsympathetic elders.

One nervous girl of nine years, a stutterer and subject to many fears, is not able to go to sleep if she recalls after retiring that she has forgotten to say good-night to some member of the family. A boy of seven, with an over-active imagination, after going to bed rehearses for hours his play and story experiences of the day. Another cannot find the bed comfortable, and calls his parents a dozen times to tuck him in. If they do not come, he cries and moans. An adolescent girl was for years kept awake at night by fear of death and hell. The fear did not leave her during sleep, but disturbed her dreams and caused her often to wake with a sudden start to realize again with renewed horror the awful doom inevitably awaiting her.

Home study nearly always robs the nervous child of the margin of sleep he so much needs. It not only causes him to remain up later, but is likely to induce an excited condition of mind, which is followed by superficial and disturbed sleep. Arithmetic lessons are especially unsuited for home assignments, but because of their quality of definiteness are just the kind of home work with which children are most likely to be burdened.

Night terrors. In children from six to ten years of age night terrors are a common disturbance. They are occasionally provoked by indigestion, obstructed breathing or other reflex irritations, but in most cases of chronic recurrence are associated with other heriditary nervous taints, notably migraine. They are often present in chorea. The condition is symptomatic

of general nervous instability. *The child who suffers often from night terrors deserves special oversight on the part of parent, teacher and physician.* Often it is wise to remove such a child from school.

In a study of a precocious and talented boy, one of the writers has uncovered an extreme case of prolonged suffering from night terrors. The following clinical description will no doubt add to the reader's interest in the case:

Age when study was made, 14 years. Mother, who was 46 years old at his birth, a woman of remarkable intelligence and decided literary ability. Father, though a ne'er-do-well, was from one of the best families of England. The son, a musical prodigy at 6 years, attacked by chorea at 7 years; since which period he has suffered from tics and automatisms. Because of his nervousness, has not attended school since age of 7. Taught by his mother and has excellent literary taste. He constantly improvises music, and shows remarkable ability and interest in botany. He is independent of thought, oldish, and very talented, but neurotic and "queer."

From the age of eight to about twelve this boy suffered the most horrible night terrors imaginable, for two years almost nightly. These involved drowning, falling from cliffs and steeples, being shot, mangled, seeing himself lying dead, crossing frail bridges over bottomless chasms, being placed in hell, undergoing countless forms of torture, etc. Sometimes in his dreams a crowd of people would poke at him with red-hot irons. Sometimes he walked through dark and gloomy places, when horrible faces would suddenly appear. The most terrifying dream of all, though the subject does not understand why it should have been so, was one in which he found himself looking down into a deep well, which grew deeper and deeper the longer he looked, until, with a scream of terror, he would awaken. Some of his nightmares belonged to the class of "continued" dreams. One of these lasted nearly a month. It began in a bleak, cold house in which the subject thought himself starving and dying of thirst. After what seemed an interminably long time one drop of water and one crumb of bread would appear. These were ravenously consumed, and then after another small eternity another drop and crumb came to tantalize him.[4] The following night he found himself

[4]The boy and mother had some months previously remained without money or friends in the city of New York *in a half-starved condition.* The boy fully expected at the time to die of starvation. He has always lived in grinding poverty, eating his bread without butter and often going without meals altogether.

in the same house, but other persons were with him. Gradually these changed their human shapes. More and more joined the throng, each newcomer more horrible, mis-shapen and gorilla-like than the others. The next night these monsters began an endless series of tortures, biting off his nose, poking at his eyes, starving him, etc. This continued with variations for many nights, each dream ending with cries and waking. Finally the monsters began to die, each with nerve-racking screeching and groaning. But for each one that died one or two others appeared, still more horrible. The continued dream ended in death from starvation.

This boy insists that he *has never had a pleasant dream.* All his dreams have been nightmares. At the age of twelve years he made a determined effort to free himself from these *by willing not to have them.* No one suggested this. Immediately they became less frequent, and finally ceased almost altogether.

We have in the above case a peculiar combination of neurotic constitution, rheumatic diathesis and unfortunate mental and physical influences. Not many children have suffered from night terrors as this boy has, but many nervous children are afflicted to a less degree. To condemn such children to the sedentary life of the school or to burden them with school tasks or over-strenuous musical training is a mistake.

It is not yet clear to what extent the Freudian method of psycho-analysis displays the true mechanism of such dreams, or how successfully the method may be applied in the therapeutic treatment of stubborn cases.

It may be added that children of school age are seldom affected with protracted *insomnia.*

Teaching Children to Sleep.

Teachers do not control the homes of today, but they are implanting the ideals which will condition the homes of to-

morrow. That only 3.1 per cent. of the school children in the mild and equable climate of California enjoy open-air sleeping-rooms suggests what remains to be done in this line of instruction.

The teacher should know the poor sleepers in her classes and those who suffer night terrors or other fears and obsessions which interfere with sleep. She should know which children drink coffee, tea and beer; which ones sleep in crowded and ill-ventilated bedrooms. Facts demonstrate that a large proportion of the homes stand in need of expert advice in these and kindred matters. Here, as elsewhere, poverty and ignorance take their greatest toll out of the lives of little children.

The presence of the physician in the school should not arouse a mistaken sense of assurance that all will now be well as regards the physical needs of the child, and that the teacher can safely turn over every responsibility of this kind to the medical examiner. The latter usually has several thousands of children under his charge, and cannot pay heed to all the conditions which concern the individual child. As already suggested, the teacher should make a health survey of her pupils, and should strive to do what she can to improve the conditions which she finds to exist.

Sleep ranks with food as one of the most imperative needs of the human organism, and like the latter it has its educational and economical aspects as well as its physiological and biological. But while diet has long received a liberal share of attention from economist, hygienist and biologist, the scientific study of the hygiene of sleep has been hardly more than initiated. We seem to have rested content in the supposition that sleep of satisfactory quantity and quality can always be had when needed. Theoretically, and under natural conditions, this may be true. Under the unnatural conditions of modern life it is not true. In this respect the problem is analogous to that of ventilation. The ocean of fresh air is always at hand, but the problems of the ventilating engineer are none the less real.

APPENDIX.

The Sleep of the Feeble-minded.[5]

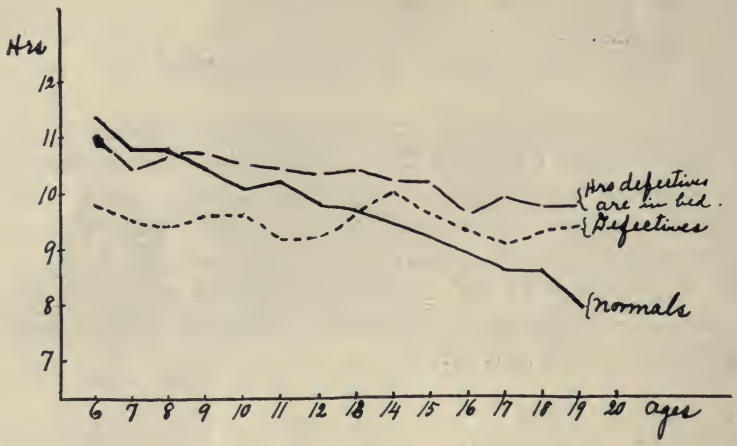
Through the courtesy of Superintendent Johnstone and Dr. Goddard of the Vineland Training School, the authors were able to make a comparison of the sleep of feeble-minded individuals, both children and adults, with that of normals. Sleep records of 383 inmates were secured under the immediate supervision of Dr. Goddard, together with supplementary data, according to the following question sheet, which was filled out for each individual:

(1) Sex .....Age .....
(2) Grade of mentality.....
(3) Type of defective.....
(4) Regular hour of going to bed.....
(5) Regular hour of getting up.....
(6) At what hour does patient usually go to sleep? (Give an actual record if possible).....
(7) At what hour does patient usually awaken? (Give actual record for same night as above if possible).....
(8) Is sleep usually *unbroken, somewhat broken*, or *very much broken?* .....
(9) Disposition of patient:—quiet, irritable, good-natured, self-controlled, violent, fits of temper, moody, anxious, nervous, lacks self-control, lacks energy.....
(10) Conditions of health.....Physical defects.....

RESULTS.

(a) *The sleep of mentally defective children, according to chronological age.* The following chart shows the average hours of sleep for the 193 of our defectives (sexes taken together) whose ages lay between six and nineteen years. For sake of comparison, the curve for our normals is produced, also a curve showing the average number of hours by *chronological ages* our defectives are allowed in bed.

[5]The writers are greatly indebted to Dr. Goddard and Superintendent Johnstone for their interest and co-operation in the study.

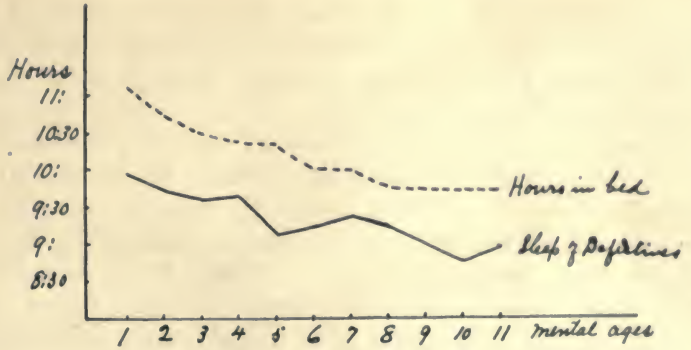


The interesting thing about the above curve is that *age differences are practically non-existent with the defectives.* The only marked rise in the curve comes at fourteen years, the sleep of children six to twelve running slightly lower than that for the ages sixteen to nineteen. If the curve for defectives had been prolonged to include the ages above nineteen years, it would be found practically horizontal from twenty to forty, with marked but gradual rise thereafter to sixty and above. The averages by decades are as follows:

	Number.	Sleep in hours and minutes.
Ages 21-30	137	9.05
Ages 31-40	39	9.06
Ages 41-50	11	9.26
Ages 51 and upwards	3	10.

Our data, however, for the years six (two cases), seven (three cases) and above fifty (three cases) are too scanty to be reliable.

(b) *The relation of sleep to degree of mental deficiency.* This is shown in the following chart, together with another curve indicating the average number of hours spent *in bed* by the feeble-minded individuals of various *mental ages.*



Again it is seen that the amount of sleep bears little relation to intelligence, and the conclusion arrived at in Part II of the study of normal children is borne out. To test the matter further the hours of sleep of the defectives of each chronological age were tabulated separately for each "mental age." The results showed only very slight differences for chronological age, whatever the degree of mental defect, and such differences as were found are possibly due to the fact that the lowest grade defectives are allowed, on the average, a little more time in bed than are the higher grade defectives (see chart).

Low grade defectives, whatever their chronological age, sleep much less than normal children of the *same mental age*, while high grade mental defectives sleep as much as normals of the same mental age, or even more. Thus practically all our sixteen-year-old feeble-minded children whose mental ages fall between two and six years, inclusive, sleep the same number of hours, namely, nine and a half. Although the younger feeble-minded are allowed much more time in bed than are the older, their period of sleep is but little different.

In trying to understand the feeble-minded individual child from the biological and genetic point of view, the question of correlation or non-correlation of the sleep requirements to degree of mental retardation is extremely interesting. It is unnecessary to add that our own scanty data, vitiated as they are by the regimen of institutional life, do not pretend to give any final answer to this question, still less to explain any rela-

tion that may be present. Whether sleep be explained in terms of instinct, chemical and toxic influences or neural metabolism, the influence of extreme mental defect upon it is of interest both theoretically and practically.

(c) Does the relative smallness of age differences in the sleep of these feeble-minded individuals as compared with normals indicate a *genuine contrast between normals and feeble-minded,* or is the phenomenon due merely to the daily program of the institution? It is evident from data already presented that the institutional program would act to *reduce* any genuine age differences that might exist, but since the hours in bed are regulated *in part* according to chronological age, we should hardly expect the age differences in sleep to be so completely obliterated. The fact of obliteration would itself indicate the extreme plasticity of the sleep habits.

This point, however, can only be settled by the collection of sleep records from children who do not lead an institutional life, and the writers would be glad to secure the co-operation of teachers of public school *special classes* in the collection of data on the subject. Correspondence with this end in view is invited.

(d) *Sex differences* of importance do not appear in our sleep records of the feeble-minded.

(e) For each age the *variability among the feeble-minded* as regards hours of sleep is much less than for the normals. This may be wholly the result of institutional life.

(f) Among the feeble-minded, as among normals, no relation appears between *hours of sleep and the number of "nervous traits."*

(g) In *quality of sleep* the feeble-minded of each grade of mentality compare favorably with normal children. The figures for all grades taken together show that the sleep of 89 per cent. is "practically unbroken;" that of 8.4 per cent. "somewhat broken," and that of 2.6 per cent. "very much broken."

In conclusion, it may be said that unsatisfactory as are our data on the feeble-minded, they indicate in an interesting way the comparative lack of dependence of mental efficiency upon hours of sleep. Our feeble-minded children, whatever the

grade of defect, sleep much *less* than normal children of the same age, the feeble-minded adults much *more* than normal adults. As regards sleep, the feeble-minded seem to retain throughout life the characteristics of childhood.

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AN ANALYSIS OF THE MIRROR DRAWING EXPERIMENT.

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SUMMARY.

1. The analysis of the mirror-test presents distinctive learning types. Some subjects gain control of the situation by a fairly regular procedure, others temporarily lose control at some point in the series. The majority of the latter lose control at the fourth or fifth trial in a series of six tests in the mirror drawing.

2. This examination further indicates that, where the time of each individual series is referred to the total time curve, fast, slow, and irregular are fairly fundamental distinctions.

3. Finally, an accurate knowledge of the learning process, must, in the last analysis, be based on individual and small group curves.

Professor Starch, in an article in the Psychological Bulletin (2), presents a method of demonstrating the trial and error learning process, and gives a learning curve. Professor Dearborn, whose arrangement of apparatus was used by Starch, discussed the individual variations of the learning process in this and other methods of experimentation at the Minneapolis meeting of the American Psychological Association in 1910. One of the writers, while listening to this paper, recalled that the result of a mirror test then in progress for another purpose showed details similar to these. The experiment[1] was a series of correlations of four general intelligence tests and the college grades of a number of freshmen in the University, one

[1]For a full account of the experiment see this JOURNAL, Vol. IV, No. 4, April, 1913, p. 223.

of the tests used being the mirror-drawing test. A further study of the time records from this test led the writers to believe that there might result something of profit from the examination of this test by itself. The results of this examination are reported here.

The records studied are those made by thirty elementary school boys and one hundred and three college freshmen. Fifty-two of the latter are girls and fifty-one are boys. The apparatus and its arrangement are figured in Whipple (3, p. 345). The pattern used differs somewhat from those previously described. Six sheets were prepared for each experiment, as follows: The circumference and center of a circle 16 cm. in diameter were drawn on ordinary paper, and twelve equi-distant points were indicated on the circumference. This paper was laid over the six sheets, the center and these twelve points on the circumference were marked by pin holes through the paper, and the pin holes on each sheet were designated by the digits from '0' to '12' in mirror handwriting. The digits were placed in irregular order, with the exception of 0, which always marked the center. The arrangement of digits differed on each of the six sheets, but the sheets for the separate trials came in the same order for all of the subjects.

Such an arrangement eliminates practically all automatic drawing, and demands care and attention throughout the series of six trials that constitute a single experiment. It also makes the time for an experiment longer and changes its character somewhat, for each digit must be 'hunted for' at each trial. The memory process is limited largely to the recall of the method of drawing by the reverse movement of mirror writing.

None of the subjects knew how many trials would be allowed, but all were urged to make each trial better and faster than the last. We are aware that a discussion of results on a time basis alone is only a partial report, but no adequate means of measuring accuracy has as yet been devised.

TABLE I.—*Medians, Averages, Etc.*

	Trial.	1st.	2d.	3d.	4th.	5th.	6th.	Av.
1. Slowest.	Total. . . .	752	337.5	303.5	175	201.75	171	242.37
	Girls. . . .	700.5	337.5	303.5	153.5	201.75	171	242.37
	Boys	752	277	270	175	121	105	193.33
	Elem. . . .	517	245	205	180	158	113	210
2. Fastest.	Total. . . .	31.5	23.5	19.25	18.25	17.75	17	21.95
	Girls. . . .	31.5	23.5	19.25	18.25	17.75	17	23.05
	Boys	72	49	40	34	33	23	46.87
	Elem. . . .	69	51	41	43	40	32	53.66
3. Medians.	Total. . . .	127.5	90	59	52	47	39.5	75.2
	Girls	92	65	48	41	35	28	54.7
	Boys	167.5	105	80	68	56	48	97.83
	Elem. . . .	243	121	93	82	68	50	110.33
4. Averages.	Total. . . .	169.11	99.15	71.41	59.68	54.41	42.23	82.55
	Girls	121.06	81.37	55.70	46.95	46.30	34.5	64.41
	Boys	218.10	117.27	87.42	72.67	62.67	50.12	101.06
	Elem. . . .	236.5	128.5	98.6	93.1	77.5	55.5	115.09
5. M. V.'s.	Total. . . .	93.98	41.89	30.22	22.91	18.99	15.58	33.54
	Girls	64.09	33.93	26.63	19.31	21.96	14.21	27.4
	Boys	104.21	39.33	30.31	19.66	19.86	13.49	33.38
	Elem. . . .	94.9	45.5	28.1	34.7	24.7	17.1	36.57

LEGEND.—'1' of the table shows the slowest time made in each of the six trials, by boys and girls taken together, by each sex separately, and by the elementary boys. '2,' '3,' '4,' and '5' follow this arrangement under their different rubrics. 'Av.' at the head of the eighth column gives the average of the six tests as shown in each line of figures of the table.

These curves correspond to the usual learning curve, human or animal, where the 'ironing-out' process of increasing the number of individual curves used is applied. It is in the high mean variations and lines marked 'fastest' and 'slowest' that large individual variations are first noted. But even here there is practically no intimation of the complexity and variability shown in the following tables.

The sex difference in rate discussed in a previous paper is in evidence. The elementary boys are slower than either group of the freshmen. In two of the trials, the first and third, their M.V.'s are better than those of the freshmen boys.

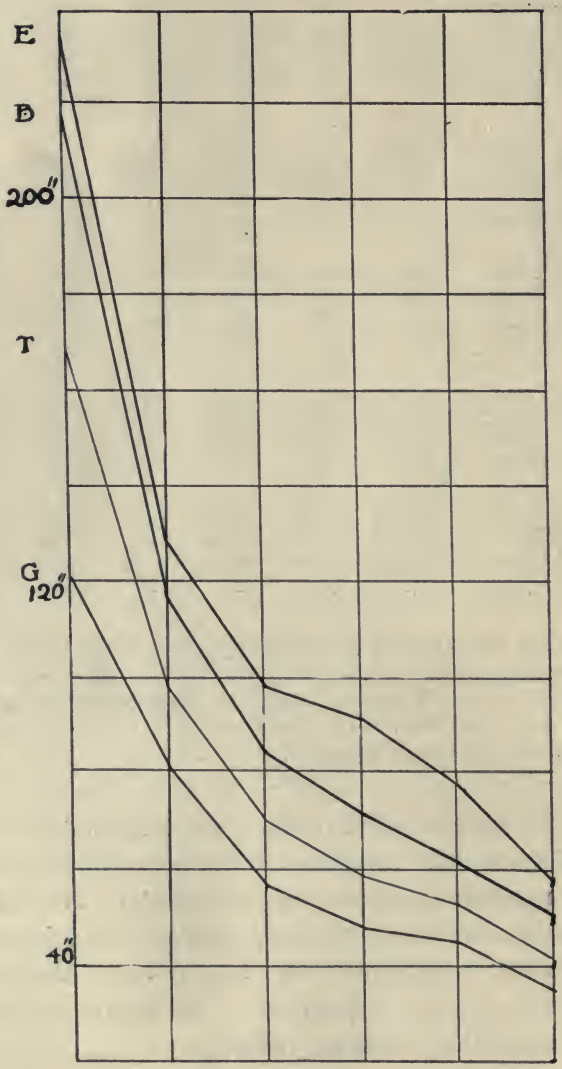

PLATE I. "E" represents the average time for the elementary boys, "B" the freshmen boys, "G" the freshmen girls, and "T" shows the average time for the total number (103) of college freshmen.

TABLE II.—*Table of Frequencies in Mirror Drawing.*

Trial.	Total Freshmen.						Boys.						Girls.						Average.		
	1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6	T.	B.	G.
11—20	..	..	1	2	4	12	..	..	..	..	..	..	..	..	1	2	4	12	..	..	..
21—30	..	4	10	11	16	24	..	..	..	..	..	5	..	4	10	11	16	19	5	..	5
40	2	8	11	12	22	17	..	..	2	1	10	12	2	8	9	11	12	5	11	2	11
50	5	4	13	25	15	24	..	1	4	13	8	14	5	3	9	12	7	10	5	3	3
60	5	7	19	14	16	12	..	2	10	9	12	8	5	5	10	5	4	4	17	9	14
70	8	16	11	6	15	4	..	6	7	5	4	4	8	10	4	2	1	0	10	5	1
80	1	7	7	14	10	7	1	5	3	9	6	6	0	1	3	5	4	1	0	4	4
90	8	7	7	4	2	1	3	3	6	2	2	1	5	4	1	2	0	..	9	3	5
100	5	9	7	3	6	0	1	6	5	3	5	0	4	5	2	0	1	..	7	8	4
10	7	6	3	4	2	1	4	3	3	3	2	1	3	2	2	1	0	..	8	3	0
20	5	6	3	3	2	..	2	4	2	3	1	..	3	2	0	..	1	..	4	2	1
30	7	6	4	1	1	1	4	5	3	1	1	..	3	1	1	..	..	..	2	1	0
40	4	5	1	0	0	..	2	3	1	0	..	..	2	2	1	..	..	..	3	3	2
50	8	4	1	0	0	..	5	4	1	0	..	..	3	0	..	..	..	..	3	3	0
60	2	1	2	2	0	..	1	1	2	1	..	..	1	0	..	1	..	..	4	3	1
70	5	3	0	0	1	..	4	1	0	0	..	..	1	2	..	..	1	..	3	1	..
80	3	3	1	1	0	1	3	1	1	1	..	..	0	2	..	..	..	1	1	0	..
90	1	0	..	..	0	..	0	0	..	..	..	..	1	..	..	..	..	..	0	1	..
200	1	1	..	..	0	..	1	1	..	..	..	..	0	..	..	..	..	..	1	..	..
10	1	0	..	..	1	..	1	0	..	..	..	..	0	..	..	..	1	..	..	..	..
20	3	1	..	..	..	..	3	1	..	..	..	..	0	..	..	..	..	..	..	..	..
30	1	0	..	..	..	..	0	0	..	..	..	..	1	..	..	..	..	..	..	..	..
40	0	2	..	..	..	..	0	2	..	..	..	..	0	..	..	..	..	..	..	..	..
50	1	1	..	..	..	..	1	1	..	..	..	..	1	..	..	..	..	..	1	..	1
60	2	0	..	..	..	..	1	0	..	..	..	..	0	..	..	..	..	..	..	..	..
70	2	0	..	..	..	..	1	0	..	..	..	..	1	..	..	..	..	..	..	..	..
80	0	1	..	..	..	..	0	1	..	..	..	..	..	..	..	..	..	..	..	..	..
290	1/15	0/1	..	..	..	..	1/12						/3	/1	/1						

LEGEND.—/15, etc., at the bottom of the table indicate cases that fall beyond the '290' limit of the table. The portion of the table headed 'Average' gives the distribution of the average of the six trials for all the freshmen and for the boys and girls separately.

The first four trials give no real distribution curve, so great is the individual variation. The fifth and sixth give good distribution areas on several unit bases. If we separate the sexes, a satisfactory distribution curve appears in the fourth trial. This shows that the modes for the two sexes are different. These individual and sex variations are so great that the distribution curve of the total averages falls into three fairly distinct modes. With all the great variations of the first four trials, and with the small numbers of individuals used, the sixth trial shows that the mode and curve of the test itself is finally regular. The curve of distribution for boys is slightly more regular than the one for girls. To repeat, the time consumed in the first trial is an individual variation; that of the last more nearly represents the individual's place in the group. In the first and sixth trials we really have two measurements of a single individual.

A ranking sheet for these six trials was prepared and correlations were figured from the rankings in order to estimate how nearly each individual tended to maintain his rank of the first trial in each succeeding trial. The coefficients of correlation of each trial after the first, with the first, are as follows: .79, .76, .74, .64, .59. Correlating the first trial with the average of the six gives a coefficient of .93. The results here correspond well with the analysis just made above. Learning curves are individualistic, and tend to become less so as the external difficulties wear off. The massing of individual curves into a single curve obscures this fact.

Two hundred and thirteen, the average number of seconds for G.R. in the first trial, is the base for all curves shown here. It is taken equal to 10, and the corresponding numbers for the other times were obtained by using a slide rule. The digits by each curve show the number of subjects whose averages are represented in the curve. The middle curve represents the total of each group. The upper is always for the boys of that group.

The following table is an attempt to show certain of these variations hidden in the general curves described above:

TABLE III.—103 *College Freshmen.*

Group.	1st.	2d.	3d.	4th.	5th.	6th.	Equal.	No. in preceding lines.	In subsequent lines.	Here only.	Total.
G. R.....	213	109	78	58	49	38	..	..	..	31	31
2 > 1....	146	181	101	78	80	58	..	..	5	4	9
3 > 2....	170	67	95	68	48	40	1	..	6	3	9
4 > 3....	158	85	59	69	59	43	1	3	12	17	32
5 > 4....	138	94	68	55	65	45	7	15	3	18	36
6 > 5....	112	71	48	41	34	37	2	6	..	5	11
					52 *Girls.*						
G. R.....	144	63	40	34	25	21	..	..	..	9	9
2 > 1....	139	177	105	74	85	57	..	..	3	3	6
3 > 2....	123	54	82	54	42	23	..	..	5	1	6
4 > 3....	105	67	46	57	50	32	1	2	8	7	17
5 > 4....	129	90	56	45	60	41	6	10	3	12	25
6 > 5....	85	62	43	37	32	35	2	6	..	2	8
					51 *Boys.*						
G. R.....	241	129	102	67	57	45	..	..	..	22	22
2 > 1....	160	223	100	87	70	59	..	..	1	2	3
3 > 2....	296	93	155	96	60	55	1	..	1	2	3
4 > 3....	217	107	75	84	70	55	..	1	4	10	15
5 > 4....	156	107	71	64	75	54	1	5	1	6	11
6 > 5....	185	97	64	52	38	44	..	..	..	3	3
					30 *Elementary Boys.*						
G. R.....	279	148	103	88	64	51	..	..	..	8	8
2 > 1....	71	79	71	52	51	46	..	..	2	..	2
3 > 2....	190	102	117	82	76	58	1	1	4	3	8
4 > 3....	243	120	85	114	84	54	..	2	4	5	11
5 > 4....	213	121	92	79	89	60	..	6	1	3	10
6 > 5....	314	184	159	100	100	109	..	2	..	..	2

LEGEND.—Numbers in columns headed 1st, etc., are the averages of the individual records falling in that group and trial; *e. g.*, 'G. R.,' etc., together with the number in the column headed 'Total,' reads '21 individuals gradually reduced their time through the six trials;' line 2 reads '9 individuals made a slower record in the second trials than in the first,' etc. The column headed 'Equal' shows those counted in the group, but who, in reality, made the trial in the time of their preceding trial. The last five columns, then, deal with a further distribution of individuals.

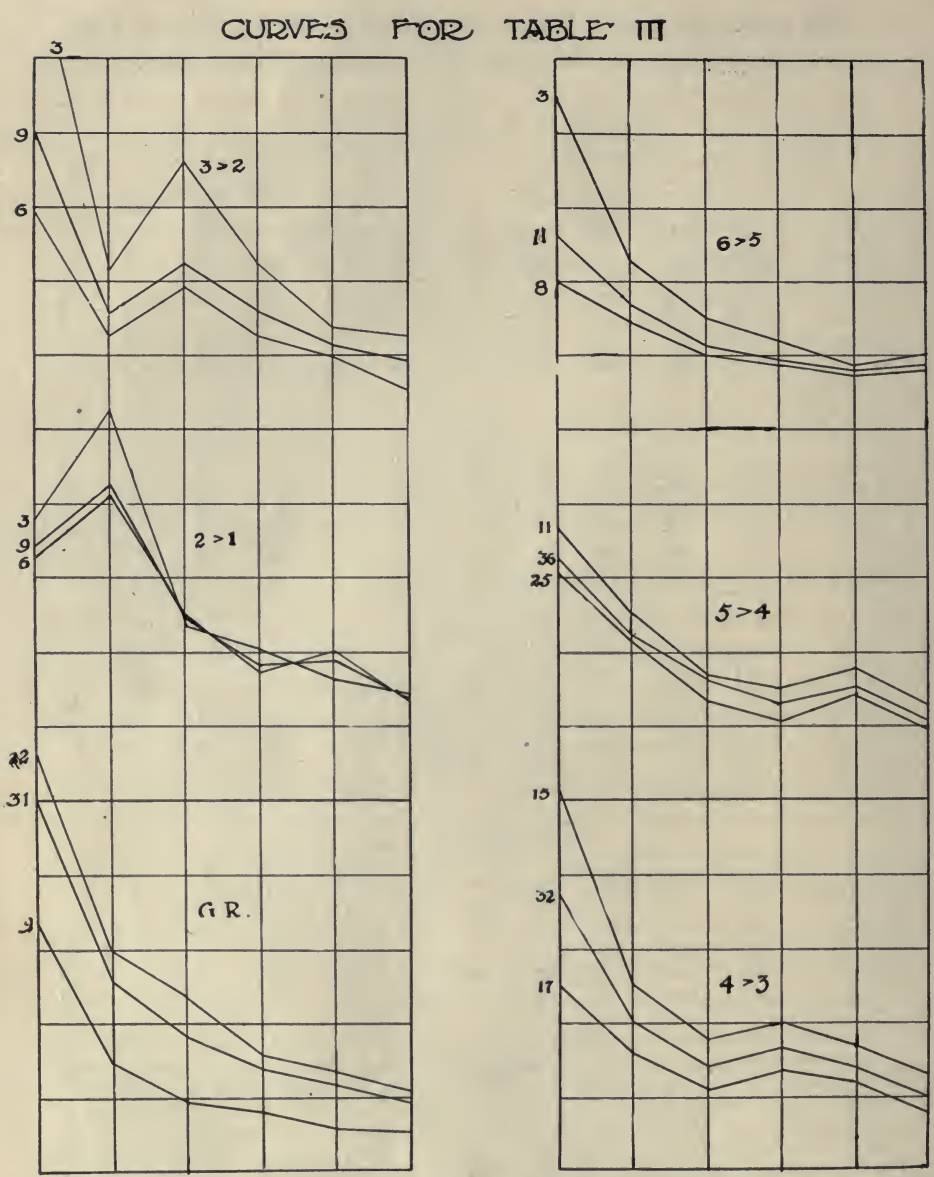

PLATE II. The curves show the average of the individual records falling in a given group and trial. The digits to the left of each curve show the number of individuals included in the group. The upper curve of each set represents the boys, the lower the girls, and the middle the total. "G.R." represents the records of those who gradually reduced their time through the six trials. "2>1" gives the records of those whose time on the second trial was greater than on the first. "3>2" indicates the showing of those who took longer on the third trial than on the second, etc.

With the exception of line 2 > 1 (2 is greater than 1) where two places of difficulty occur for the girls, their records are always lower than the corresponding trials in the boys' records. Notwithstanding this superiority in absolute speed, they give the same variation as the boys from trial to trial.

A greater proportion of boys than of girls appears in the 'gradual reduction' group. In all groups, including the elementary boys, trials four or five increase the number of individuals who fail to maintain their previous rate of work. These trials seem to suffer from a temporary difficulty of some sort. More individuals who have irregularities in other trials belong to this group; this is indicated by Columns 8 and 9 of the table. More caution is exhibited by the boys in approaching the experiment. Relatively few of them, 21 per cent., make more than one decrease in rate, while 52 per cent., approximately, of the girls are found in other rate-decreasing groups, or trials. About 53 per cent. of the elementary boys make more than one decrease in the rising practice curve. In other words, the girls and elementary boys lose control much more frequently than the boys.

We may have either six or three groups represented by these curves. G.R. and 6 > 5 constitute a division that is fairly consistent in practice gains; 2 > 1, 3 > 2 and 4 > 3 are distinctly irregular; 5 > 4 suggests a group of individuals who are at the first plateau in their increase in rapidity.

TABLE IV.—*Distribution of Subjects with Respect to the Different Medians.*

General Median.

	Total.	Above.	Below.	Shift above.	Shift below.	Irregular.
Boys	51	3	24	12	12	..
Girls	52	26	6	9	11	..

Separate Medians.

Boys	51	15	12	8	6	10
Girls	52	15	15	2	5	15
Elem.	30	8	9	3	4	6

LEGEND.—This table indicates the number of subjects who made records faster or slower, or became faster or slower, or shifted both above and below the different medians. The medians used are shown in Table I. The first division here is based on the general median for college freshmen irrespective of sex. The others follow as in Table I; *e. g.*, 'Above' means these remained above the median.

Table IV again points to specific variations in the learning process. As indicated by this table, some are slow, others fast, and still others irregular in three possible ways. A few of these irregular ones gain a better position, others lose their early advantage, and still others are simply irregular.

Certain permanent differences will be found among the individuals who attempt to revise well-established co-ordinations and make new ones. Averages of and curves drawn from the totals of any one of these groups will often barely indicate these variations. The general features of all the learning curves are similar. It is in the comparison of the individual curve and of the small group curve, with the curve of the total, that these differences appear.

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1. Downey, J. *Control processes in modified handwriting; an experimental study.* Psychol. Rev. Mon. Supp., V. 9, No. 37.
2. Starch, D. *A demonstration of the trial and error method of learning.* Psychol. Bull., V. 7, pp. 20-23.
3. Whipple, G. M. *Manual of Mental and Physical Tests.* Baltimore, 1910, pp. 343-350.

COMMUNICATIONS AND DISCUSSIONS.

A NEW FORM OF THE SUBSTITUTION TEST.

The purpose of this communication is to call attention to a form of the substitution test which may be used for testing a higher type of learning than that involved in most forms already adopted.

Several different tests, all of which may be classed under the general head of substitution tests, have been published. Dearborn[1] and Starch[2] have used two different forms. The first is one in which a number is to be substituted for each letter in the alphabet as 25 for "a," 7 for "b," etc. The key is placed at the top of the page, the material to be written is printed in short lines down the left hand side of the page, and the substitutions are to be made in blank squares to the right of each printed line. The second test is one in which a character is to be substituted for each of the digits as X for 8, = for 9, etc. The same general form for the page upon which the test appears is used as before, and the test consists in writing certain numbers by making the substitutions suggested above.

Whipple[3] suggests two variations of the second form, but they are so similar to the original test that no further explanation is necessary.

Woodworth and Wells[4] have used a test which consists of a number of characters placed at the top of the page, each of which encloses a digit. The characters used are the star, circle, square, cross and triangle. Below this key the page is filled with the characters without the digits, and the test consists in writing the proper digit in the different characters. It is very simple, and lends itself readily to work with children, even in the first grade.

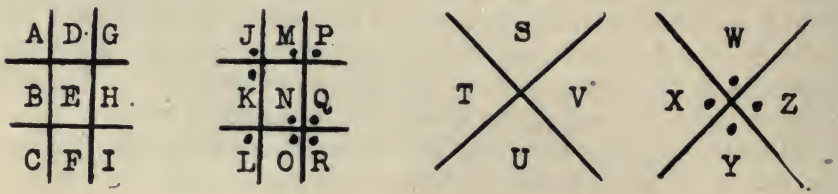
The great objection to be made to the foregoing tests is that the type of learning employed is extremely mechanical. Such tests emphasize a kind of learning which the school has long ago discounte-

[1] Journal of Educational Psychology, Vol. 1, 373-384.
[2] Journal of Educational Psychology, Vol. 3, 47-70.
[3] Manual of Mental and Physical Tests, 350-355.

nanced, and which it is trying more and more to eliminate from its work. The effort of the school is to have the learning of the pupil based upon reason and judgment, and thus pitched upon a higher plane than that employed in the usual form of the substitution test. In other words, it certainly would not be safe for a teacher to think that the learning curve of one of her pupils procured by means of the substitution test would be indicative of the pupil's learning in geography, except in the most general way, for geography is largely a reasoning subject, and is being taught more and more as such.

From the standpoint of general psychology the study of any type of learning is important; but from the standpoint of education it is essential that the mental activity be put upon a plane which approaches that of the schoolroom, and if educational psychology is to have a vital influence upon school procedure, it must focus its efforts upon the higher mental activities.

A test which approaches a higher type of learning has been suggested by Healy and used by Goddard[5] in his revision of the Binet Tests. It is a code used during the Civil War, and is as follows:



The suggestion given for the use of this test is that after the subject is shown how to use the cypher he be required to write the expression, "caught a spy." Although it has never been used as a basis for any extended work, one can see possibilities in it for such, and if so used it would certainly involve a higher type of learning than that employed by the tests suggested on the preceding pages.

The test[6] employed by the author for the past two years is shown below. The general form is that used by Dearborn. It is to be

[4]Psy. Rev. Mon. Sup., Vol. 13.

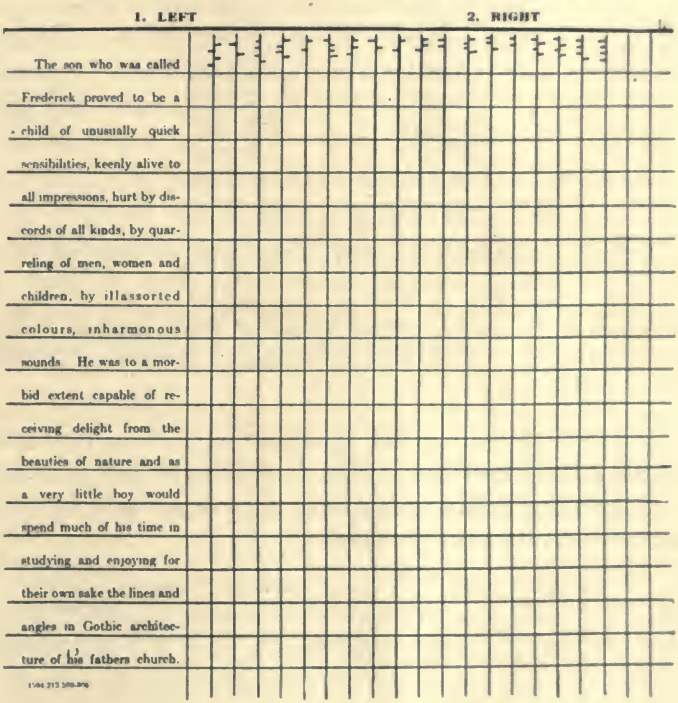
[5]Holmes. *School Organization and the Individual Child*, p. 10.

[6]The code was suggested to the author by one of his students, Miss Katherine Wells, while she was working on Dearborn's test. It was invented by her father, Mr. Elbert Wells, and published in a book entitled "Outdoor Signalling," by the Outing Publishing Co., New York.

noted that the number combinations make use of only two digits, "1" and "2." In transcribing the printed material, wherever a "1" occurs a short horizontal line is to be made to the left of the vertical line which serves as a "base" line for the particular letter transcribed, and wherever a "2" occurs a short horizontal line is made to the right of the "base" line. The horizontal lines are to be drawn in the order in which the digits occur. Thus H would be ⊣, M would be ⊣⊢, etc. In this manner the first line has been written out on the page shown.

Plate I

Z 2212 X 222 K 1211 G 1122 B 111 V 22 Q 212 J 122
P 211 W 221 F 1121 U 2122 L 1212 C 112 M 1221 Y 2211
D 1111 H 12 I 121 A 11 T 2121 E 1112 N 1222 S 2112 O 21 R 2111



The total amount of printed material used for the test is placed upon five sheets similar to the one shown.

About one hundred and fifty students have taken the test. The plan used has been almost identical with that suggested by Dear-

born,[7] except that directions for introspection have been given in much greater detail. The number of possible introspections is large because the test is somewhat complex. This complexity is made apparent by noticing that there are from two to four digits which stand for the different letters, and these digits, in turn, must be transcribed into horizontal lines. It might be said to be a double substitution test.

Another important thing about the test is that it is constructed according to a definite plan, which shows itself very clearly when the letters are arranged in their regular order, as follows:

A 11	H 12	O 21	V 22
B 111	I 121	P 211	W 221
C 112	J 122	Q 212	X 222
D 1111	K 1211	R 2111	Y 2211
E 1112	L 1212	S 2112	Z 2212
F 1121	M 1221	T 2121	
G 1122	N 1222	U 2122	

This key is comparatively simple and can be learned in a short time.

The letters are placed in three groups of seven each and one group of five. The word "AHOV" gives the letter with which each group begins.

The first two digits in all the combinations for the first group are 11, for the second are 12, for the third are 21, and for the fourth are 22. The other digits used follow each other in a way which is constant for the different groups.

The first time the test was given nothing was said about the key, and after the work was handed in an inquiry revealed that no one had discovered any system to the figures used for the letters. The second time the test was given the hint was dropped that by grouping the letters in certain ways the learning could be facilitated very much; but a canvass of the class showed that no one had done anything of this sort. The third time the explanation was clearly made

[7] JOURNAL OF EDUCATIONAL PSYCHOLOGY, Vol. 1, page 379.

that there was a principle running through the combinations, and that the discovery of it would be of great help, but no one made such a discovery.

The problem now is to evolve a technique which will make it incumbent upon the subject to work out the principle running through the combinations. It is quite evident that this will have to be some motive other than that established by a mere speed test. It is possible that a test for retention which would follow the experiment at some stated time can be used.

The possibility of having the subjects put system and organization into their work, and the possibility of measuring the retention due to this kind of work, are two of the best points in the experiment.

Another possibility is to have the test put in such a form that the key can be given first. This would be an easy thing to do from the standpoint of technique, and would certainly give some interesting and valuable results.

The curves obtained so far have been very similar to those published by Dearborn and Starch, but the large number and the different types of associations have been exceedingly interesting. The types of imagery, the motor element of both the eye and hand, the varying degrees of neatness in the work, as well as many other points, seem to make the experiment a promising one.

C. TRUMAN GRAY.

University of Texas.

AN EXPERIMENT WITH 'UNDIFFERENTIATED' INSTRUCTION.

Two years ago the committee on method of the Leipzig *Lehrerverein* began an experiment on the instruction given in the first three school years. Instead of giving the work of these years as three distinct units with formal lines drawn between subjects and grades, it was proposed to break down these lines and use what might be termed 'undifferentiated' instruction' (*Gesamtunterricht*). The experiment was to be in reality one involving the principle of *concentration;* there seems actually to have been no attempt to hold rigidly

to a central core for all the work. About thirty children, boys and girls, of average ability were selected from *Bürgerschule* 11 and placed in one room under charge of *Lehrer* Brückner, who was to be free to follow any order in instruction that he saw fit. Absolute freedom as to order and method was to be allowed.

A visit to this classroom will convince any careful observer that the results of the experiment will be affected more by the fine teaching ability and breadth and personality of the teacher than by any factor lying in the methods of instruction as such. While a man of middle age with good scholarship and psychological insight, Mr. Brückner still has all the patience and kindness of an ideal kindergarten teacher. It is an inspiration to see him teach. He makes large use of his associations with the children on the playground to aid and to supplement his instruction.

The experiment has now been going on for two years, and a report on it is in preparation. According to Mr. Brückner three results are already quite clear: first, the freedom of the instruction has added remarkably to the interest and happiness of the children; second, the work in all the subjects except arithmetic has been equal to, and in many cases better than, that in the other regular classes of the same grades; and third, the arithmetic work has been distinctly inferior to that of the other children with the same amount of schooling. Certain methods of conducting the experiment are, of course, open to criticism; but no one can doubt that experiments of this kind must play a larger rôle in the future development of experimental pedagogy.

CLAYTON C. KOHL.

Mt. Holyoke College, South Hadley, Mass.

COLLEGE MARKING SYSTEMS.

The demand[1] for a "rational college marking system" appears to be securely based in so far as it maintains that the ranking marks have little meaning unless the percentage of men admitted to each rank accords with a recognized standard. (For example, A, 10 per cent.; B, 15 to 20 per cent.; C, 40 to 50 per cent.; D, 15 to 20 per

[1]Compare SMITH, this JOURNAL, September, 1911.

cent.; failure, 10 per cent.). But the mark of failure is not a ranking mark; it indicates that the student would better not proceed along a certain line of work without repeating the subject in which he has failed. Hence it seems that the ideal number of failures must always be just none at all. Whereas to give A to 100 per cent. of the men would make nonsense of all ranking marks. The "probability curve" is hardly competent to decide that, because 10 or 3 per cent. of the men are to be marked A, 10 or 3 per cent. of the men must repeat the subject. It is significant that, when the Michigan Department of Literature, Science and the Arts adopted the scale suggested above, there was an approach to the percentages named, except that the percentage of failures continued below 3 per cent. instead of approaching the 10 per cent. required by a symmetrical imagination.

This distinction between ranking and passing marks appears to be fundamental. Granting that more men are passed in some classes and fewer in others than we believe should pass, it hardly seems the proper remedy to tell each professor that in the long run we shall expect a certain per cent. of his men to do the work so poorly that they must repeat the subject in whole or in part. It seems that under proper conditions no one would be invited to commence a term's work with the expectation that he must fail and repeat it. With due attention to planning the work, admitting men to classes, and keeping track of their progress, it often seems possible, even now, to insure that none shall fail.

PERCY HUGHES.

Lehigh University.

INTERVALS IN ECONOMICAL LEARNING: A CORRECTION.

To the Editor of the Journal of Educational Psychology:

Dear Sir—Will you kindly give space for the following correction of a statement made by Mr. Pyle in his article on Economical Learning in the March number of your JOURNAL?

In discussing a report of experiments published in Volume I of the JOURNAL he states: "Only one condition should be varied at a time. If we start out to settle the question of interval, we should

keep the time constant, and if we try to settle the question of time, we should keep the interval constant. Dearborn does not compare 10 minutes a day with 5 minutes a day, but with 5 minutes *twice* a day, which is quite a different matter." The trials in the experiments referred to were in each case ten minutes in length—in one series once a day, in the second series twice a day. The length of the periods of practice was, therefore, kept constant and the interval alone varied.

The length of the periods of practice was not given in the original article referred to, since the article was not written as a report of results, but as a description of experiments in education available for use as class experiments. Mr. Pyle has evidently made a calculation as to the time and has possibly been misled by an error which appears on page 384, line 14, of the article referred to. The section should read "Section A completed the test in 16½ days of practice; section B in 18 *half* days (instead of days) of practice with two intervals a day at about twelve hours apart."

May I be permitted to add that undoubtedly the varying of one condition at a time is the logical way to attack the problem. Nevertheless, because of the very large amount of experimentation involved, it is quite possible that for one interested in the results alone, and not in the relative effects of the time factors, reliable calculations as to economical learning may be reached more rapidly by judicious variation of the length of the period of practice and of the interval between practice *at the same time.*

There appears also to be some tendency in present experimentation to neglect the fact that both factors may vary according to the *sort* of work done and that different intervals of time when associated with periods of practice suited to them may give equally good results.

Very respectfully yours,

WALTER F. DEARBORN.

Harvard University.

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VOLUME IV MAY, 1913 NUMBER 5

EDITORIALS.

AMATEURISM IN BINET TESTING ONCE MORE.

One way of making a strong impression is by repetition. And this desire, then, to be emphatic, must be our excuse for repeating here the burden of an editorial set forth in these columns in February of 1912. We then said: "Our large city school systems, with a few conspicuous exceptions, have not yet realized the imperative need of establishing psychological clinics or bureaus of child study, or even of employing a consulting psychologist. When psychological examinations come to be introduced, they tend, failing a psychologist, to fall into the hands of medical inspectors, which is bad enough, or to be assigned outright to classroom teachers, which, perhaps, is worse." And nothing that has developed in the use of the Binet tests during the past year has led us to alter this conviction. Rather, the really capable critiques—like, for example, the address given by Professor Stern of Breslau at the recent German Congress for Psychology, and now published in monograph form—while confirming and strengthening our confidence in the general value of the root principle of the method, reveal more and more difficulties in the administration and appraisement

of the tests themselves. We need only refer to the very bothersome question as to how accurate inferences can be made from the results of a test to the practical mental status of the child—to his classification, in other words, as normal, backward, moron, etc.

We are led to these remarks by the report that the medical inspectors in the city of Pittsburgh, seemingly inspired by the misleading assurances of certain writers who state that the Binet tests, in the hands of physicians, nurses, teachers and other laymen, constitute an "amazingly accurate" and infallible measuring rod, now aspire to take over all the psychological phases of investigatory work in the Pittsburgh school system. And we can only express our hopes that these reports are unfounded, or that at least those in authority may be led to understand that for a person, whoever he may be, without extensive psychological training to attempt to diagnoze the precise mental status of a school child is about as absurd as for a mere psychologist to attempt to diagnoze incipient tuberculosis or any other obscure pathological condition. G. M. W.

WORK NOT A MEASURE OF EFFICIENCY.

One of the most mischievous sources of error in experimental pedagogy at the present time is the assumption that achievement is a measure of capacity. A few years ago it was thought that we could measure fatigue in terms of the "work curve," but, as has been shown in the last fifteen years, the change in quality and quantity of work under strain varies not only with fatigue, but also with numerous other factors inseparably associated with it. Indeed, it has been clearly shown that, in many of the most strenuous mental occupations, oncoming fatigue is not signaled by loss in capacity for work either quantitative or qualitative; for, like a race horse, the mind does its best after it has been worked into a heat. The increase in excitement, oncoming automatisms, and many other kindred factors often more than offset the loss through fatigue. This principle is seldom adequately recognized in current investigations on the value of certain hours of the day, on the effect of certain stimuli to action, or on the influence of various conditions of work. There is great need at the present time of a thorough analysis of the work curve in order that the factors entering into this may be taken into account and, if possible, controlled in educational experiments upon efficiency. C. E. S.

At the recent session of the Ohio Legislature it was enacted that a survey should be made of all the educational interests in the State. The survey will be in charge of Dean W. W. Boyd of the department of education of the Ohio State University, and upon its results will be based future legislation on educational matters.

An important aspect of the International Congress of School Hygiene, to be held at Buffalo, August 25-30, will be a systematic agitation for the extension of medical inspection to all the schools of the United States.

A series of psychological clinics will be conducted in connection with the Mental Hygiene Exhibit to be held at the International Congress of School Hygiene in Buffalo next August. Demonstrations will be made of various psychological tests of individual diagnosis and of group tests which have been used to measure the mental improvement produced by the application of rational principles of mouth hygiene, and which have also been used to measure the differences in the rate of mental growth between epileptic and public school children. The clinics will be under the supervision of Dr. J. E. W. Wallin, director of the psychological clinic and professor of clinical psychology in the School of Education, University of Pittsburgh.

The third session of the Johns Hopkins Summer School, July 1-August 12, offers an attractive list of courses for teachers. Professor Buchner gives the course in educational psychology, Prof. Fletcher B. Dresslar, George Peabody College for Teachers, offers courses in school hygiene and principles of education, and courses in administration, supervision, and methods are announced by Superintendent Cook of Baltimore County, Principal Anna Brochhausen of Indianapolis, Assistant Superintendent Josephine B. Stuart of New Bedford, Mass., and Miss Florence M. Lane, principal Model Rural School, Kirksville, Mo., State Normal.

Among the visiting professors in education and psychology at the Dartmouth Summer School will be Associate Superintendent Clarence E. Meleney, New York City; District Superintendent Albert Shiels, New York City, and Dr. Raymond H. Stetson, professor of psychology, Oberlin College.

At the six weeks' course given in Knoxville last summer at the University of Tennessee twenty-five hundred teachers were present from twenty-four States, including many from Pennsylvania, New

Jersey, Delaware and Maryland. This year two hundred courses will be given by almost as many instructors. Among those to be present are Miss Julia C. Lathrop, chief of the Child's Bureau of the United States Department of Labor; Dr. and Mrs. Southwick of Boston; Prof. B. T. Baldwin of Swarthmore, Prof. George B. Foster of Chicago and Edward Howard Griggs. Doubtless a great number of people interested in education will take advantage of these courses, since the low tuition, cheap board, special rates and delightful climate make this a splendid opportunity for teachers in this neighborhood to come into contact with teachers from all parts of the United States and especially from the South.

The budget of the University of Illinois, now before the Legislature, contains an item for $120,000 for a School of Education building. This building, if erected, will provide classrooms and laboratories for the School of Education, and quarters for a medium-sized secondary school to be used for observation and training purposes.

At the Conference and Exhibit on Mental Hygiene, held in Pittsburgh, April 21-26, the psychological clinic of the University of Pittsburgh had on display a variety of graphs, charts, test blanks and publications.

At the meeting of the Philosophical Society of the University of Virginia, Friday, May 9, Prof. W. H. Heck delivered an address on "Experimental Education."

Prof. Charles Hughes Johnston of the University of Kansas has accepted a professorship of secondary education in the School of Education, University of Illinois. He will begin his work in Illinois in September, 1913.

Professor Ira Richardson, head of the department of education and training, Northwest Missouri State Normal School, has been elected president of that institution. Professor Richardson succeeds President H. K. Taylor, who has resigned on account of ill health.

According to the daily press, Prof. Ernest C. Moore, head of the department of education, Yale University, has been invited to become professor of education in Harvard University in association with Prof. Paul H. Hanus. It will be recalled that Professor Moore was connected with Professor Hanus in the New York School Inquiry Commission.

CURRENT PERIODICALS.

(In this section only such articles will be noticed as bear directly or indirectly upon the interests of this Journal.)

TEACHERS' COLLEGE RECORD. Vol. XIV, No. 1, January, 1913. LEONARD RIGHTER. *The Educational Survey Preparatory to the Organization of Vocational Education.* 3-43. The schools exist for the benefit of the people, but in many communities neither the people nor the school authorities know whether or how the people are benefited. There is an increasing demand for more knowledge in this matter, and hence a growing interest in educational surveys. The present article is a valuable contribution to the technique of an educational survey.

ROBERT J. LEONARD. *Social Phases of Industrial Life and Their Relation to Industrial Guidance.* 44-64. The school must know the industrial life of the community in order to give proper advice to pupils regarding the choice of a life work. Some important social phases of community life are here discussed and illustrated by reference to the industrial conditions of New York City.

No. 2, March, 1913. *The Curriculum of the Horace Mann Elementary School. Arithmetic, Geography, History, Music.* Pp. 76. In arithmetic emphasis is laid on the selection of problems from the environment of the pupils, speed and accuracy in fundamentals, self-dependence in problem work, and free use of number games. Geography is begun in the third grade, and is dominated throughout by social and economic considerations. History begins in grade I with the festivals of the home, is then extended to early life on Manhattan, colonial history, Greek, Roman and medieval history, and closes with an intensive study of American history in grades VI and VII. The curriculum in music will be very helpful to less carefully organized schools.

ZEITSCHRIFT FUER ANGEWANDTE PSYCHOLOGIE. Vol. VII, No. 1, December, 1912. MAX HENTSCHEL. *Two Experimental Investigations on Children in Tone Psychology. I. Judgment of Musical Intervals.* 55-69. Tests of the judgment of musical intervals from the second to the octave were made on 491 school children from nine to fourteen years. The greatest uncertainty in the judgment of the second tone was found in the case of the major second. The girls were from 2 to 3 per cent. behind the boys in accuracy of judgment.

OTTO LIPPMANN. *Experimental Studies in Arithmetic (Collective Review).* 97-107. An analytical discussion of the method and results of three recent investigations to determine the relative difficulty of combinations in addition and multiplication.

W. Matz. *Report on the Psychological Phases of the Fourth International Congress for the Teaching of Drawing and Art, Dresden, 1912.* 108-120. A large part of the program was devoted to the consideration of the psychological foundations of drawing, and studies of children's drawings.

ZEITSCHRIFT FUER PAEDAGISCHE PSYCHOLOGIE UND EXPERIMENTELLE PAEDAGOGIK. Vol. XIV, No. 1, January, 1913. N. Ach. *Studies of the Will and Their Relation to Education.* 1-11. Emphasis is laid on the means by which inhibition and reinforcement of volition are furthered, and the author discusses the part that training may play in the development of determining tendencies.

Aloys Fischer. *Important Problems of Kindergarten Reform.* 11-17. The present wave of experimental investigation into the mental nature, aptitudes, and interests of school children has left the kindergarten altogether to one side. The author discusses several problems of the kindergarten which call for experimental study, and points to the experimental kindergarten of the Munich Teachers' Association as the type of organization that is needed for the furtherance of such study.

L. W. Weber. *On Normal and Pathological Lying.* 18-29. Emphasizes the importance of distinguishing carefully between the two, since the ordinary punishments and restraints will be ineffective with the pathological liar. The aim of education in truth-telling should be the displacement of egoistic by altruistic motives, and the development of self-control.

M. Schaefer. *Elements of the Ethical Judgments of Young People.* 47-59, 90-98. The author propounded to 1250 elementary school pupils from twelve to seventeen years of age the question, "Why is stealing forbidden?" The analysis of the answers shows that in spite of the special religious training which these German young people received, religious motives play an insignificant role in their moral judgments after the fourteenth year. The social motive rises to a high position with the normal children, while it yields to the egoistic motive in the feeble-minded.

Paul Wagner. *On the Mathematical Treatment of the Results in Investigations of Immediate Memory.* 60-63. A series of formulae whereby the graphic representation of the results of memory tests may be translated into numerical expression.

No. 2, February, 1913. Gustav Deuchler. *Psychology and Morphology of School Work.* 81-90. The teacher must necessarily work with the class rather than with individual pupils, yet the influence of class spirit upon the work of the teacher and the class has received litle scientific consideration. The author outlines a program of investigation in this important field.

PUBLICATIONS RECEIVED.

(Notice in this section does not preclude a more extended review.)

A. R. ABELSON. *Tests for Mental Deficiency in Childhood.* Reprinted from *The Child,* October, 1912. 1-17.

The author attempts to supply the deficiencies in existing tests by elucidating the principles upon which such tests are essentially based. No tests are suggested that are essentially new.

JOHN ADAMS. *The Evolution of Educational Theory.* New York: The Macmillan Company, 1912. Pp. ix, 410. $2.75 net.

The most important work that has come from the pen of this fertile and stimulating writer. In the twelve chapters of the book the author deals with the nature and scope of education, the characteristics of the educand, the prehistoric and the historic development of education, the social and the individual aim, formal *versus* specific training, humanism and the culture aim, Rousseau and naturalism, Froebel and the idealists, quantitative measurements in education, and the educational outlook. In the final chapter he calls for a more detailed personal record card which shall indicate the physical and mental status of the educand, shall be revised at stated intervals, and shall accompany him throughout his school life. This might enable us to attain an educational efficiency comparable to the industrial efficiency for which all large manufacturing concerns strive in their elaborate systems of records.

Addresses and Proceedings of the National Education Association, Chicago, Ill., 1912. Ann Arbor, Mich.: National Education Association, 1912. Pp. 1427.

FRANK P. BACHMAN. *Report Upon Promotion, Non-Promotion and Part Time.* New York: Committee on School Inquiry, 1913. Pp. 114.

This is part of the report of the Hanus Commission for the investigation of the "Educational Aspects of the Public School System of the City of New York." It is the most thorough and elaborate study of non-promotion ever made in this country. Dr. Bachman urges the adoption of a uniform and detailed report sheet for each

teacher which would furnish specific data as to the number of pupils that drop out of school each term and the reason therefor.

La Reine Helen Baker. *Race Improvement or Eugenics.* New York: Dodd, Mead & Co., 1912. Pp. 137. $1.00 net.

This little book presents in plain, simple fashion some of the most important topics in practical eugenics. The emphasis on the right of the child to be well born, the duty of society toward the child whether born in wedlock or not, the encouragement that may and ought to be offered to fit matings, the rights of woman as man's equal in the propagation of the race, the precautions that society should take to prevent the procreation of the unfit, are subjects that deserve the careful consideration of every serious-minded person, and the interest manifested by the intelligent women of the country in such discussions is a most encouraging symptom.

Bibliography of Child-Study for the Years 1910-1911. Compiled by Clark University Library. Bulletin No. 498. Washington: Bureau of Education, 1912. Pp. 90.

Edgar Ewing Brandon. *Latin-American Universities and Special Schools.* Bulletin No. 504. Washington: Bureau of Education, 1913. Pp. 153.

A richly illustrated account of the work of higher institutions of learning in Central and South American countries.

R. C. Brooks. *Report of the N. E. A. Committee on Teachers' Salaries and the Cost of Living.* Ann Arbor: Published by the Association, 1913. Pp. 328.

The secretary of the committee, who is a professor of political science in the University of Cincinnati, here presents a mass of material, very uneven in value, on the increased cost of living, the economic and social status of teachers in a select group of American cities, and typical plans and schedules of teachers' salaries, tenure and pensions.

William Forbes Cooley. *The Principles of Science.* New York: Henry Holt & Co., 1912. Pp. v, 245.

The aim of the author in this book is "to show how the inquiries of physical science lead inevitably to questions and problems which transcend the field of present-day science, that is, to questions of philosophy." He presents interesting discussions of such scientific concepts as matter, energy, mechanism, law and evolution, leading back to the fundamental postulates of science, and to a consideration of the rationality of the world.

STUART A. COURTIS. *Report on the Courtis Tests in Arithmetic.* New York: Committee on School Inquiry, 1913. Pp. 158.

The Hanus Commission for the investigation of the New York School System endeavored as far as possible to make use of scientific methods of evaluating school procedures, and was fortunate enough to secure the services of Mr. Courtis himself in the application of his Standard Tests in Arithmetic to a representative number of New York school children. Over 33,000 pupils in 52 schools were tested, and the results are tabulated in this report. The data are so voluminous and there is such a formidable array of statistics and graphs that the monograph is difficult to summarize. The most striking fact is perhaps the extreme individual variation in the arithmetical abilities of children in the same grade and school. The results of such scientific measurements show how impossible it is for any school training to equalize native differences in mental ability.

GEORGE VAN NESS DEARBORN. *Nerve Waste.* Boston: Health Education League, 1913. Pp. 29. Seven cents.

This little booklet presents in popular form a statement of the debits and credits of the clearing-house for nervous energy, and gives some pertinent advice for keeping a safe balance on the right side of the ledger.

JEAN FINOT. *Problems of the Sexes.* New York: G. P. Putnam's Sons, 1913. Pp. xiv, 408. $2.00 net.

The author believes that the logical way of arriving at a comprehension of present conditions and tendencies is through historical perspective, and therefore traces the history of the relation between the sexes, and endeavors to obtain a scientific background for the consideration of the present feminist movement. His chief conclusion is that each sex is superior to the other in certain respects, that the mission of each is to supplement the other, and that this can only be attained when woman is not only left free, but given the most favorable conditions to develop her nature to the fullest extent.

JOHN M. GILLETTE. *Constructive Rural Sociology.* New York: Sturgis & Walton, 1913. Pp. xiii, 301. $2.00 net.

The problem of rural education is essentially a social and economic one, and, therefore, all those who are interested in rural schools will welcome this attempt to survey rural conditions from the sociological point of view. "The purpose of this volume is to provide in a clear and untechnical way the fundamental facts upon which judgments about past development, present tendencies and future growth are to be based. It brings together in compact and convenient form a mass of significant facts and it draws sane and careful inferences.

Professor Gillette has shown a clear grasp of the subject and has given us a valuable book which will be welcomed not only in school and college, but by the general reader."

HENRY HERBERT GODDARD. *The Kallikak Family.* New York: The Macmillan Company, 1913. Pp. xv, 121. $1.50 net.

Much has been said and written concerning the famous Jukes family, and the suffering and economic loss which has been inflicted by them upon society. It has never been definitely determined, however, just how much of their depravity was due to heredity and how much might be attributed to the unfavorable conditions of the environment. In the present book Dr. Goddard relates the history of two branches of the same family which he has been able to trace accurately to its division over a century and a quarter ago. In the normal branch all the members are of sound mind and of brilliant attainments in social and professional life. The abnormal branch, started by illicit relations with a feeble-minded girl, numbers four hundred and eighty descendants. Of these one hundred, forty-three have been definitely proven feeble-minded, while only forty-six have been found normal. The rest are unknown or doubtful. It is a fascinating, yet strictly scientific, account of the terrible menace to society which lurks in the unrestricted liberty of the feeble-minded.

G. STANLEY HALL, KENYON COX, STOCKTON AXSON AND OLIVER S. TONKS. *Art Museums and Schools.* New York: Charles Scribner's Sons, 1913. Pp. vii, 144. $1.00 net.

This is a collection of four lectures delivered at the Metropolitan Museum of Art in New York City. President Hall, discussing Museums of Art and Teachers of History, emphasized the value of charts, pictures, etc., in vivifying and actualizing the facts of classical history. The American mind runs to clear, vivid images rather than to abstract problems, yet much of our high school teaching is of the dry, dull text-book sort, with little attempt to render any assistance to the imagination. One of the chief duties of every corps of high school teachers is to enlist the co-operation of their pupils in establishing a school museum. Dr. Axson spoke of the value of the museum for teachers of English, Dr. Tonks discussed its significance for teachers of the classics, and Mr. Cox emphasized its importance for teachers of art.

CHARLES HART HANDSCHIN. *The Teaching of Modern Languages in the United States.* Bulletin No. 510. Washington: Bureau of Education, 1913. Pp. 154.

While the teaching of modern languages has improved wonderfully in the past few years, there is still much to be desired. The chief difficulty is to secure properly trained teachers.

MARCUS HARTOG. *Problems of Life and Reproduction.* New York: G. P. Putnam's Sons, 1913. Pp. xvii, 362. $2.50 net.

This is an interesting series of essays on biological subjects by the professor of zoology in University College, Cork. Of importance for educationists are the chapters on the transmission of acquired characters (in which the author is a firm believer), mechanism and life (a defense of neo-vitalism), the biological writings of Samuel Butler, with especial attention to "Unconscious Memory," interpolation in memory (a study of certain phases of the learning process), and the teaching of nature-study.

EDUARD HITSCHMANN. *Freud's Theories of the Neuroses.* New York: Nervous and Mental Disease Publishing Co., 1913. Pp. 154. $2.00.

A synthetic presentation of the Freudian theory; a most welcome contribution for those who desire to get the gist of this movement.

WILHELM JERUSALEM. *Die Aufgaben des Lehrers an höheren Schulen.* Wien und Leipzig: Wilhelm Braumüller, 1912. Pp. xii, 392. M. 9.

In the past twenty years the number and importance of our high schools have increased in a marvelous manner, and we are now confronted with the problem of providing an adequate supply of teachers for these schools. In the training of secondary teachers we are far behind Germany, and we may well look to her for counsel. The present book, which discusses the status of German Middle Schools and the tasks of the teachers in those schools, gives a clear, definite and intelligible account of what the secondary school teacher should be and do. Perhaps the most important part of the book is the fourth and fifth chapters in which the author presents a lucid and convincing analysis of the didactic, the ethical and the social tasks of the teacher. The book should be widely read by students of secondary teaching in this country.

CLARENCE D. KINGSLEY. *College Entrance Requirements.* Bulletin No. 514. Washington: Bureau of Education, 1913. Pp. 110.

An elaborate statistical study showing the present status of entrance requirements in 204 colleges of liberal arts, 85 colleges of engineering and 31 colleges of agriculture.

N. KRAEMER. *Experimentelle Untersuchungen zur Erkenntnis des Lernprozesses.* Leipzig: Quelle und Meyer, 1912. Pp. 97. M. 3.

An elaborate experimental study of the learning process of five adults. The author used twenty-seven different selections of ma-

terial, all of the same length, but varying in difficulty from the simplest narrative to involved philosophical prose. The "whole" method was used in general, but the subjects were allowed to vary this somewhat on occasion. The plan of procedure was to have the subject read the selection over a sufficient number of times to give the conviction that most of it could be reproduced. After the attempted reproduction a detailed report of introspection on the methods of learning was written out. The reading was then resumed and the process repeated until the selection could be perfectly reproduced. A test of retention was made after twenty-four hours. The monograph is an important contribution to the study of learning.

EMIL KRAEPELIN. *General Paresis.* New York: Nervous and Mental Disease Pub. Co., 1913. Monograph Series No. 14, pp. 200.

A translation from the German by J. W. Moore, M.D. A most important up-to-date chapter from Kraepelin's clinical psychiatry.

ARTHUR MACDONALD. *Bibliography of Exceptional Children and Their Education.* Bulletin No. 506. Washington: Bureau of Education, 1913. Pp. 43.

An annotated list of the important contributions to the subject during the past decade.

ROBERT MACDOUGALL. *Mind as Middle Term.* Reprinted from the Psychological Review, 19: No. 5, September, 1912. 386-403.

All behavior studies imply consciousness and must, therefore, be classed as psychological inquiries in the strict sense of the term.

HUGO MÜNSTERBERG. *Psychology and Industrial Efficiency.* Boston: Houghton Mifflin Company, 1913. Pp. 309. $1.50 net.

This is the most elaborate attempt yet made in English to apply the principles of experimental psychology to economic and industrial conditions. Part I deals with "The Best Possible Man," and gives an account of the limited number of experiments that have been made to determine the fitness of an individual for a given piece of work. This is, of course, merely a matter of comparison and selection, such as is going on all the time, but with scientific methods the selection may be made much more quickly, and great saving may be accomplished. Part II, "The Best Possible Work," discusses learning, attention and fatigue, as applied to industrial conditions. Part III considers the means of producing the "Best Possible Effect" in advertising, displaying and selling commodities.

HUGO MÜNSTERBERG. *Vocation and Learning.* St. Louis: The People's University, 1912. Pp. 289.

An analysis from the psychological point of view of the demands

which are made by the various vocations. The treatment is philosophical rather than experimental. The chief types of vocation considered are those of the engineer, the farmer, the business man, the teacher, the domestic worker, the secretary, the physician, the lawyer and the architect.

GILBERT MURRAY. *Four Stages of Greek Religion.* New York: Columbia University Press, 1912. Pp. 223.

These delightful studies of Greek thought by the Regius Professor of Greek in the University of Oxford grew out of a course of lectures delivered at Columbia University. The first, "Saturnia Regna," limns in clear outlines a picture of the earliest gropings of the Greeks after an explanation of their world; the second, "The Olympian Conquest," traces the evolution of the Homeric gods; the third, "The Failure of Nerve," describes the great wave of pessimism that followed the overthrow of democracy and culture; and the fourth, "The Last Protest," recounts the final unavailing struggle of Greek ideals under Julian to maintain themselves against the "otherworldliness" of triumphant Christianity.

WILLIAM BAXTER OWEN. *The Humanities in the Education of the Future.* Boston: Sherman, French & Co., 1912. Pp. vi, 187. $1.25.

A series of twelve addresses well written and well worth reading. The essential truth of Chapter II, "The Value of Discipline in Education," would not be in the least obscured if cast in the terminology that the investigations of transfer have developed.

MAUD PERRY. *Understanding People Through the Stars.* Rochester, N. Y.: Walrond's Occult Publishing Co., 1912. Pp. 59. 60 cents.

It is a continuous marvel what solemn nonsense some people will accept if it is only presented to them in authoritative fashion. If any one is curious on this point he may safely be referred to the above book.

Problems in Eugenics. Papers Communicated to the First International Eugenics Congress, University of London, July 24-30, 1912. London: Eugenics Education Society, 1912. Pp. xix, 489. 8s.6d. net.

This is doubtless the most extensive and authoritative collection of eugenics papers ever issued, and should be in the hands of all those who are interested in the present status of eugenics propaganda. The Congress, as well as the papers presented at it, was arranged in four sections: Section I, Biology and Eugenics; Section

II, Practical Eugenics, including eugenics and education; Section III, Sociology and Eugenics; and Section IV, Medicine and Eugenics.

Reports of Investigations by Members of the Society of College Teachers of Education. School Review Monographs, No 3. Chicago: University of Chicago Press, 1913. Pp. 45. 53 cents.

The papers of especial interest to educational psychologists are "Psychological Characteristics of the Intermediate Grades," C. H. Judd; "The Abilities of Special Groups of High School Students in the Subjects Which They Studied," G. D. Strayer; "A Study of Association in Children of the Elementary School," E. E. Jones; and "An Experiment with the Courtis Tests in Arithmetic," E. E. Rall.

ARTHUR SCHULTZE. *The Teaching of Mathematics in Secondary Schools.* New York: The Macmillan Company, 1912. Pp. xx, 367. $1.25 net.

This is an exceedingly important work on the teaching of high school mathematics. Its chief object is "to contribute towards making mathematical teaching less informational and more disciplinary. Most teachers admit that mathematical instruction derives its importance from the mental training that it affords, and not from the information that it imparts." Nevertheless, "students still learn demonstrations instead of learning how to demonstrate." This constitutes a challenge to the experimentalist to determine to what extent students can learn "how to demonstrate."

F. SCHUMANN. *Bericht über den V. Kongress für experimentelle Psychologie in Berlin, April* 16-20, 1912. Leipzig: J. A. Barth, 1912. Pp. xxv, 324. M. 11.

This report contains many papers that are of importance for educational psychology. Chief of these are: W. L. Stern, Psychological Methods of Testing Intelligence; K. Marbe, The Significance of Psychology for Other Sciences and for Practical Life; O. Kulpe, The Significance of the Modern Psychology of Thinking; B. Hart and C. Spearman, On General Mental Ability; K. Bühler, The Development of Abstraction in School Children; W. Peters, The Inheritance of Mental Capacities; S. V. Maday, Psychology of the Choice of a Vocation; A. Grübaum, Observations on Reflection; Exhibition of Tests and Apparatus by the Institute for Applied Psychology. A more extended account of the Congress will be found in this JOURNAL, Vol. III, No. 8, October, 1912. Page 452.

DAVID EUGENE SMITH AND CHARLES GOLDZIHER. *Bibliography of the Teaching of Mathematics,* 1900-1912. Bulletin No. 503. Washington: Bureau of Education, 1913. Pp. 94.

Includes 1849 titles on the teaching of mathematics.

WILLIAM STERN. *Die psychologischen Methoden der Intelligenzprüfung und deren Anwendung an Schulkindern.* Leipzig: J. A. Barth, 1912. Pp. iv, 106. M. 3.00.

This is the most elaborate critical discussion of the Binet-Simon and other mental tests that has yet been presented. In his introduction the author considers the aim and general function of intelligence tests and enumerates some of the more important practical questions which create a demand for such tests. Section I gives a survey of the various types of tests that have been proposed, Section II discusses the Binet tests, and Section III suggests a more delicate gradation of intelligence tests by the use of the ranking method. No student of mental tests can afford to neglect this monograph.

WILLIAM SENACA SUTTON. *Problems in Modern Education.* Boston: Sherman, French & Co., 1913. Pp. 352.

A series of twelve addresses and essays, written for various occasions and dealing with important questions in practical education. The unifying principle of these papers "is that of concrete idealism, which is the controlling, characteristic attribute of human evolution, and which insists upon the wisdom and necessity of reckoning with environment in order to obtain desirable results."

EDWARD L. THORNDIKE. *An Introduction to the Theory of Mental and Social Measurements.* Second edition, revised and enlarged. New York: Teachers' College, 1913. Pp. xi, 277.

By this revision of his book on Mental and Social Measurements, Professor Thorndike has decidedly increased the debt which students of educational psychology owe him. With the rapid extension of the application of experimental methods to the study of educational problems it becomes increasingly imperative for the student of education to have some familiarity with the theories and methods of quantitative measurement in order to read and understand current discussions in education. For this purpose there is nothing that can equal the present book.

LOUIS WALLIS. *Sociological Study of the Bible.* Chicago: University of Chicago Press, 1912. Pp. xxxv, 308. $1.50 net.

The perusal of this masterful book opens up an entirely new view of the Bible as the chronicle of a great social struggle. "The book

is an evolutionary study of Christendom. * * * It takes the standpoint of what is called 'pure science.' It seeks to know the historical facts of the subject before it, and to interpret these facts in their actual, historical connections. * * * It is practically a general thesis on the religious phase of civilization, approaching the development of human society from the standpoint of religious interests. It aims to show that the Bible may be taken as a point of departure for the investigation of the entire process of social evolution."

William Cecil Dampier Whetham and Catherine Durning Whetham. *Science and the Human Mind.* New York: Longmans, Green & Co., 1912. Pp. xi, 304. $1.60 net.

This book aims to give in popular form "a critical and historical account of the development of natural knowledge." The chapter headings include "Science in the Ancient World," "The Medieval Mind," "The Renaissance and Its Achievement," "The Physics of the Nineteenth Century," "The Coming of Evolution," and "The Latest Stage." Owing to the extent of the field covered the treatment is somewhat sketchy and impressionistic.

Charles Edgar Witter. *Pragmatic Elements in Kant's Philosophy.* Chicago: University of Chicago Press, 1913. Pp. 76.

"There is a near approach to the pragmatic method in (Kant's) three-fold synthesis of apprehension, reproduction and recognition. * * * Pragmatism takes one of its chief inspirations in breaking away from the representational view of knowledge. * * * Kant would seem to be in harmony with this attitude in holding that the mind furnishes its own constituent factors. * * * He differs from the pragmatist in abstracting sharply this work of the understanding in thus furnishing the relating factors."

A. Duncan Yocum. *Culture, Discipline and Democracy.* Philadelphia: Christopher Sower Company, 1913. Pp. x, 320.

This is perhaps the most significant contribution of the year to educational theory. The author describes his work as "not so much an attempted solution of the educational problem as an effort to formulate it."

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THE LEARNING OF DELINQUENT ADOLESCENT GIRLS AS SHOWN BY A SUBSTITUTION TEST.

BIRD T. BALDWIN.

Professor of Psychology and Education, Swarthmore College.

This investigation is the first of a series of mental tests to be conducted by the writer at Sleighton Farm, which is the girls' division of the Pennsylvania Reformatory School.[1] The tests were completed by thirty-seven white girls and thirty negro girls, ranging between the ages of thirteen and twenty-one years. Fourteen other negro girls were too feeble mentally to perform the tests after the initial instructions, although they worked assiduously for the period of three weeks, and three white girls failed to do 50 per cent. of the work correctly. All of the girls have been committed by the courts of the State for offences such as incorrigibility, delinquency, immorality, dependency, malicious mischief, manslaughter, lewdness, fornication, vicious conduct and vagrancy. The white girls are segregated from the negroes; each of these two groups is again divided into smaller groups who live in cottages, ranked according to an honor system in the case of the white girls.

Each individual has been given a careful physical examination by Dr. Alice Weld Tallant, whose records show that only 57 per cent. of the girls in the institution (401) are below standard height as compared with Bowditch's records. About 50 per cent. are below weight. Eye defects and hypertrophied tonsils are numerous, and between 20 and 25 per cent. of the

[1]The writer is indebted to the Superintendent, Mrs. Martha P. Falconer, for her hearty co-operation.

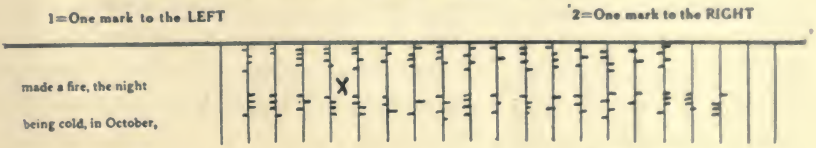
girls have venereal diseases. In regard to the teeth the dentist's records show that about one-half have poor teeth, and in about one-fifth of the cases the teeth are distinctly bad. All girls, except a few of the most deficient mentally, and those who have been demoted for misbehavior, are required to attend school for at least three and a half hours daily, except Saturday and Sunday. They are taught by college graduates from Wellesley, Smith, Vassar, Swarthmore and Wisconsin. During the school period the following test was given between 2:45 and 4:30 o'clock P. M. to five classes of girls (who had not been in school during the morning) for sixteen consecutive days, with the exception of one Saturday and two Sundays, making in all sixteen practice periods of five minutes each.

The aim of this test was to get an insight into the learning capacity of the average delinquent girl, and to note periods of acceleration and retardation in the progress of learning during the practice interim. The work, which is of such a nature that it can be carried on with little suspicion on the part of the subjects, is similar to the experiments in learning by Bair, Book, Bryan and Harter, Dearborn, Ruger, Starch, and Swift. It consists in the transliteration of a portion of Benjamin Franklin's Autobiography into a modified form of a wig-wag code used by some Texan soldiers in the Civil War.[1] The letters of the alphabet are distributed in the form of the universal typewriter keyboard, with the code equivalents attached, at the top of each of five pages. The text to be translated is placed in a narrow vertical column consisting of from seventeen to twenty letters per line at the left of each sheet under the keyboard. The remainder of the page consists of twenty vertical red lines, on which the symbols corresponding to the letters are to be placed. The code consists of different combinations of the numbers 1 and 2. The number 1 signifies that a short horizontal line is to be placed in the space to the left of the vertical red line, and the number 2 signifies that a

[1]The code was first called to the writer's attention by Mr. C. T. Gray of the University of Texas. In order to standardize the material for this test, some of the symbols were changed, a new keyboard was arranged, new reading matter added and carefully selected type was used.

similar mark is to be made at the right of the vertical red line. There are never less than two numbers nor more than four numbers to represent one letter. For example A=11, or two short marks, one below the other, to the left of the vertical red line; B=2221, or three short marks, one below the other, to the right and another below these to the left. The other letters consist of similar combinations of the numbers 1 and 2.

Q=212 W=221 E=1112 R=2111 T=2121 Y=2211 U=2122 I=121 O=21 P=211
A=11 S=2112 D=1111 F=1121 G=1122 H=12 J=122 K=1211 L=1212
Z=22 X=222 C=112 V=2212 B=2221 N=1222 M=1221



The instructions to the subjects were carefully given before the work started; an illustration of the method of writing the first two words was worked out with the classes and written on the blackboard. No information was given in regard to the errors after the first two trials, except to the apparently feeble-minded girls who were satisfied to repeat meaningless marks. Attention was frequently called to the desirability of speed and accuracy in the work.

Nothing was said at the beginning of the test in regard to practice between periods, since the work was carefully explained to all teachers, and the subjects are not permitted either paper or pencil, except during one or two school periods a day, under very strict supervision. Each girl has a separate room in the cottage, and there is little or no opportunity to discuss matters in groups outside of the schoolroom. The subjects did the work with earnestness and interest, and each was proud of her achievement at the end of a day's practice.

White Girls.

The "Senior" white girls became intensely interested in the tests, and according to the results obtained, they are a superior group. These girls showed signs of sustained attention by putting their heads down over the paper at the start,

and not raising their eyes beyond the code at the top of the paper until the five minutes had elapsed. A ten-minute period would probably not have been too long for them. The range of individual differences in ability to carry on the transliteration was very noticeable. The smallest number of substitutions accomplished on the first day by the white girls included in this report was eight letters; the largest was forty-four letters by a girl (No. 13) who knew the typewriter keyboard, and who remained in advance of all others in the school until the eleventh trial, when she was removed to her home. At the sixteenth trial eight white girls were doing one hundred and forty or more substitutions during the five-minute practice period, and the best girl (No. 3) completed two hundred and fourteen substitutions, or letters, during the last practice period. As a rule, the neatest and most accurate girls accomplished the most substitutions.

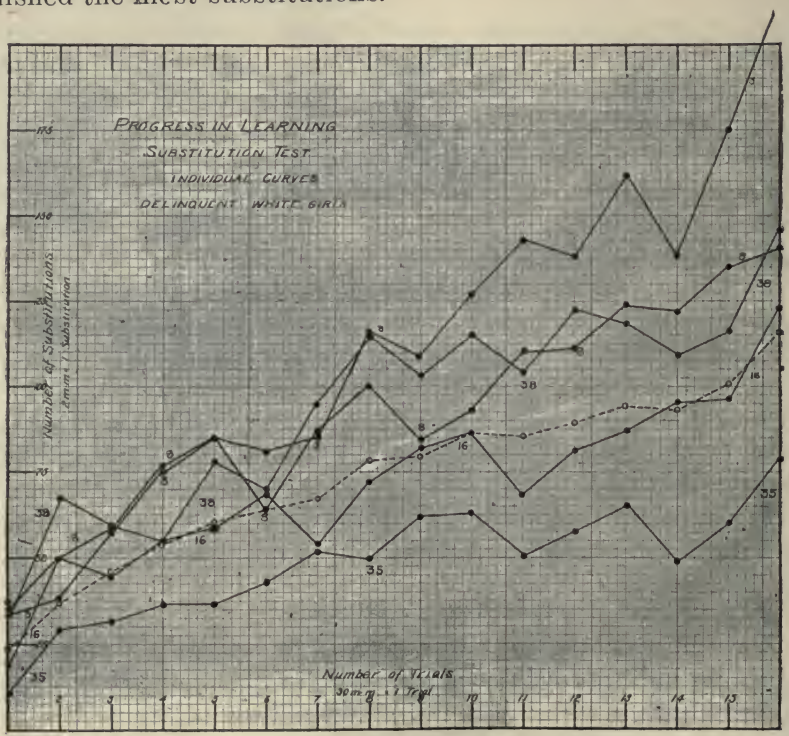


CHART I.—Progress in Learning. Delinquent White Girls.

It will be noted that no individual progresses uniformly, but each gains by irregular increments, with an occasional actual loss. There is always a gain between the first and second trial, and at the last trial. The first plateau (?) period occurs between the fifth and seventh trials, the second between the eighth and eleventh trials. These periods seem to be due to changes in method of work, and to the lack of the enthusiasm and interest manifested at the first trials. It was very evident that after the first five or six trials the interest of the better students began to wane; for the weaker students the wane came earlier than this, and there were no marked periods of later acceleration. Frequently the weaker girls continued to improve during the retarded period of the better subjects, and the practice alone was sufficient to insure slight improvement each day, until they fell into a set pace which either continued or tended to decrease in speed. The better subjects apparently would arouse sufficient energy or interest to increase for one trial during the retarded period, and then have a period of retrogression on alternate days.

The average age of the "Seniors" is 18.7 years, and the practice curve for the group (which is not included among these charts) shows a steady increase in absolute increment of gain until the sixth trial, with an irregular period of acceleration and retrogression until the eleventh trial, after which there is a steady accentuation until the end.

The twenty-two "Newly Committed White Girls" are slightly younger than the Seniors. The group curve (which is not included among these charts) shows a steady gain until the thirteenth trial, after which there is a decided drop until the fifteenth period, which is followed by a marked increase. The average curve never reaches the height of that of the other group, but the individual curves of the better subjects take the direction of the curve of the Senior group, i. e., a marked increase, a plateau period (?), another period of increase. There are a large number of subjects in this latter group who reached their maximum about the eleventh trial, and then dropped back or remained on a level; for example, No. 35 in Chart I is typical. Individual curves of this type tend to eliminate the asymmetries of the normal group curve for the better students.

The group curve for all white subjects, as shown in Chart I, shows a steady increase in improvement until the eighth day, after which the absolute increment of gain remains almost uniform until the fourteenth day, when an acceleration is evident. The time is probably too short to speak of a plateau stage.

The introspective notes given at the end of the practice periods throw light on the subsequent stages of progress or loss in the practice curves. The two difficulties most frequently mentioned at the beginning are the distinction between right and left and the location of the desired letters in the keyboard. With some individuals the second difficulty remains, although in general it was the first thing learned after a technique of making marks was acquired. The subjects state:

"We know where to look for certain letters without looking all over the paper." Others say: "Occasionally one letter gets lost in the keyboard and causes much delay." Another writes: "Sometimes when I cannot find a letter in the keyboard instantly I go on, and then put the letter down when I happen to see it."

One subject naively states: "I am doing better because the pupil of my eye has now gotten a sketch of where the letters are."

Familiarity in the location of the letters resulted in increased speed.

An accurate knowledge of the numerical equivalents for the letters was one of the last acquisitions, and the subjects almost invariably looked up the letters, since, as they state if, this required less time than to think them out. At the last trials a few individuals ignored the keyboard entirely, and stated that they knew all of the symbols; a few others said they knew all with the exception of those for Z X Y U Q J K, which appeared infrequently. The notes indicate that the first letters to be written without the aid of the keyboard were those that appeared two or three times within the same word or adjacent words.

Another change of procedure which occurred was in the method of reading the printed matter. At first all read by

letters, and the more careful subjects placed one finger of the left hand on the letters as read. It was soon noted that the better subjects were reading two or three letters, or a word, or a phrase, at one time. At the close a few claimed that they were reading by sentences when these were not too long. For example, one girl writes:

"I can do more because I remember the whole word, and I do not have to look at my words any more. I remember the word, and just keep my eyes on the keyboard and make my pencil go."

Another states: "I now remember words, phrases and sometimes short sentences."

The transition from letters to words or phrases is frequently accompanied by more errors, but these tend to disappear as rapidly as the new mode of procedure becomes more fixed.

Another increase in efficiency was found in the method of making the marks. After having grasped the fact that each subsequent mark in each letter must be slightly below the previous one, the subject began to make these lines more quickly and more uniformly. The more dexterous subjects frequently make all marks from left to right; that is, toward the red vertical lines for the left-hand mark, and away from the red lines for the right-hand marks. All reagents admitted it was impossible to increase the speed of making marks to that of reading and mentally transforming the letters.

The lowest individual average for all trials of the "Senior" group was 26.5, the highest 111.2; the former was by a slow, nervous, inaccurate, incorrigible Pennsylvania Dutch girl with slight eye defects, who was fourteen and a half years of age; the latter (No. 3, Chart I, Table I), was a short Pennsylvania Dutch girl with good eyes, good health, a baseball champion, and holder of the school record for the 100-yard dash. She is fifteen and a half years of age, and was committed, like two sisters, because she was unmanageable. This girl was the first individual to complete the five full pages of reading matter.

The five individual learning curves in Chart I show the range of individual differences, and the daily variations in the progress in learning for the sixteen days. Two millimeters on the ordinates, or vertical, equal one substitution, and fifteen on the abscissa, or horizontal, equals one trial of

TABLE I.—WHITE GIRLS.

Number of Substitutions, 40,628.
Number of Errors, 1264.
Number of Trials, 562.

No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	Average.
1. Subs.	8	18	28	47	46	55	83	86	93	93	86	107	96	123	87	..	70.4
Errors.	4	..	1	16	13	3	..	1	2	4	6	5	3	..	1	..	4.
2.....	29	46	53	68	82	90	87	108	97	102	112	130	95	108	128	145	90.
	4	..	2	1	2	3	..	4	2	1	2	2	..	..	..	..	1.4
3.....	33	38	57	75	85	81	85	116	109	132	143	138	162	136	175	214	111.2
	4	2	..	1	2	3	2	2	4	8	1	2	3	7	7	9	3.6
4.....	24	29	59	72	66	80	75	82	86	99	83	84	104	97	105	125	79.4
	..	1	3	3	..	4	16	8	6	9	2	8	4	3	2	3	4.5
5.....	32	59	64	92	81	107	92	107	97	119	118	139	119	119	142	144	101.9
	4	6	7	11	5	11	11	2	..	2	..	1	9	5	2	..	4.8
6.....	27	48	69	75	79	95	92	106	98	111	102	93	113	102	126	..	89.1
	1	1	1	2	..	1	..	1	4	1	3	..	..	..	2	..	1.1
7.....	10	25	49	44	46	55	66	68	73	87	85	81	90	93	97	107	67.3
	..	3	4	10	1	..	2	1	..	..	..	1	..	5	2	7	2.3
8.....	35	50	58	77	85	69	87	100	84	93	110	111	124	122	135	141	92.2
	..	..	..	..	..	3	1	4	1	..	..	1	4	2	..	1	1.0
9.....	31	50	81	83	91	81	88	95	89	93	79	93	..	..	..	..	79.5
	3	..	..	..	..	..	1	1	2	2	..	2	..	..	..	..	.91
10.....	34	51	49	70	72	82	65	73	86	99	97	81	85	89	..	..	73.1
	1	..	..	1	4	..	5	2	..	..	..	..	1	..	..	..	1.0
11.....	9	23	39	47	62	63	55	71	78	102	89	90	73	97	122	126	71.6
	..	..	..	..	..	..	1	..	2	1	4	4	2	1	2	2	1.3
12.....	26	28	19	29	41	47	51	58	65	72	73	78	70	60	64	83	54.0
	4	..	3	..	1	..	..	..	..	1	..	..	1	..	..	..	.69
13.....	44	65	70	71	92	103	84	109	109	139	134	..	..	..	..	..	92.7
	1	..	..	..	..	..	1	..	..	..	1	..	..	..	..	..	.27
14.....	13	27	54	70	72	86	71	109	98	117	102	106	138	135	135	140	91.0
	8	..	1	2	4	4	1	..	..	4	5	8	1	..	4	1	2.7
15.....	13	49	61	66	85	90	85	116	103	..	..	..	..	..	..	..	74.2
	..	..	3	6	..	..	..	..	1	..	..	..	..	..	..	..	1.1
16.....	18	50	44	55	59	69	53	72	82	87	68	81	87	95	96	123	71.1
	12	18	5	1	1	3	..	2	4	..	1	3	2	4	14	1	4.4
17.....	24	44	59	75	79	93	97	111	104	98	99	110	126	123	133	143	94.8
	2	..	1	..	3	..	..	..	..	1	1	..	..	2	..	..	.62
18.....	10	12	20	41	43	57	68	57	59	70	65	59	73	..	..	..	48.7
	2	..	2	..	..	2	4	2	2	6	9	10	23	..	..	..	4.7
19.....	28	57	39	48	54	72	83	91	91	62	123	107	103	127	..	..	77.5
	..	1	..	..	2	..	4	1	..	..	2	..	..	1	..	..	.8
20.....	18	40	31	30	45	49	47	66	70	84	83	84	90	66	72	91	76.8
	9	7	9	3	4	..	..	11	..	1	10	4	..	2	1	4	4.1
21.....	12	20	39	35	38	51	56	42	52	60	42	62	75	74	73	..	48.7
	1	4	4	..	..	1	..	1	1	..	..	3	1	1	..	..	1.1
22.....	37	72	47	51	41	53	63	87	104	94	86	106	105	105	100	114	79.0
	..	..	1	1	1	..	..	..	3	..	..	..	1	..	..	..	.43
23.....	19	36	44	47	55	54	64	77	63	93	71	95	115	113	109	95	71.2
	..	1	3	2	2	3	1	..	..	1	3	1	..	..	..	1	1.1
24.....	19	36	34	42	58	61	67	68	84	94	94	102	113	104	109	144	78.0
	9	12	3	2	1	1	..	..	..	..	..	3	1	..	8	..	2,5
25.....	38	57	56	66	80	78	100	104	100	103	109	123	116	104	86	111	89.4
	..	..	..	3	..	..	..	..	..	3	..	1	1	2	3	..	.81
26.....	33	67	59	55	78	70	90	115	109	115	104	122	118	109	116	146	94.2
	2	2	7	..	..	7	..	1	1	..	..	20	..	3	8	8	3.7
27.....	40	54	38	52	45	36	51	53	56	61	54	69	59	51	53	63	52.0
	20	6	..	4	..	1	1	..	..	1	..	..	2	..	..	..	2.8
28.....	10	26	21	24	32	30	27	26	34	26	34	28	..	..	..	..	26.5
	3	1	1	..	4	..	..	..	..	..	1	8	..	..	..	..	1.1
29.....	26	30	61	33	51	58	44	54	65	58	82	79	74	83	76	94	60.5
	..	..	3	3	1	..	19	1	..	..	..	1	..	3	..	2	2.
30.....	17	36	39	40	64	43	41	64	63	72	81	88	80	78	71	99	61.0
	..	5	1	2	1	7	..	..	..	1	..	1	3	2	7	1	2.
31.....	19	56	56	50	60	44	57	79	70	82	87	60	73	99	61	88	63.1
	..	1	..	..	1	3	1	..	1	..	2	1	2	1	2	..	1.
32.....	40	70	58	64	72	60	73	54	93	97	94	103	111	105	131	136	85.0
	..	..	3	..	4	1	2	..	11	8	8	9	15	4	3	7	4.7
33.....	19	38	24	34	44	35	33	41	46	48	44	50	52	53	55	57	42.0
	16	2	2	4	10	7	10	..	8	6	1	17	10	4	..	19	7.3
34.....	19	45	37	45	39	51	46	54	52	62	68	67	65	59	64	63	52.3
	10	2	2	3	8	1	6	1	..	..	..	3	..	1	1	1	2.4
35.....	11	30	31	37	37	43	52	50	52	63	51	58	66	49	60	79	48.0
	4	3	2	..	..	..	..	2	2	..	2	9	1	3	3	9	2.5
36.....	19	44	44	48	55	52	58	66	66	58	64	75	50	52	70	90	56.9
	..	..	..	7	..	5	..	..	..	..	2	..	1	..	..	7	1.3
37.....	37	49	38	48	68	59	73	64	64	83	77	74	86	71	53	75	63.7
	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	.06
Av...	23.8	42.6	46.7	54.2	61.7	64.9	67.8	78.3	79.6	86.9	85.9	89.5	94.1	93.7	100.1	116.5	72.3

(Final average for 37 white girls, 72.3)
(Final average for all errors, 2.3.)

Age.	Nationality.	School Grade.	Eye Defects.	Ear Defects.	Tonsils and Adenoids.	Health.	Cause of Commitment.
18½	Amer.	10	..	..	Sl.	Good.	Incorrigibility—immorality.
18½	Amer.	10	Sl.	..	..	Fair.	Incorrigibility.
15½	Pa. D.	10	..	..	..	Good.	Unmanageable.
18½	Amer.	10	..	..	..	Fair—Hysterical.	Incorrigibility.
19	Pa. D.	10	Sl.	..	Sl.	Good	Vicious conduct.
18	Amer.	10	..	..	..	Good.	Incorrigibility.
17½	Amer.	10	Sl.	..	Sl.	Good.	Incorrigibility.
15½	Amer.	10	..	..	..	Good.	Vicious conduct.
18	Amer.	10	Sl.	..	..	Good.	Incorrigibility.
18½	Amer.	10	+	+	Sl.	Good.	Incorrigibility.
15	Jew.	10	..	..	+	Fair.	Incorrigibility.
17½	Fr.-Eng.	6	+	+	..	Good.	Incorrigibility.
17½	Ger.-Am.	10	..	..	Sl.	Fair.	Uncontrollable and immoral.
15½	Jew.	10	..	..	Sl.	Good.	Incorrigibility.
21	Ger.	10	..	Sl.	..	Good—(Goitre).	Incorrigibility.
17½	Amer.	10	..	..	..	Fair.	Incorrigibility and delinquent.
19½	Amer.	10	..	..	..	Good.	Incorrigibility.
19	Jew.	10	Sl.	..	..	Fair—Nervous.	Incorrigibility.
15½	Irish.	5	..	..	..	Good.	Incorrigibility.
14½	Irish.	5	..	..	Sl.	Good.	Delinquency and immorality.
15	Amer.	6	Sl.	..	..	Good.	Incorrigibility.
15½	Jew.	7	..	..	Sl.	Good.	Conspiracy.
18	Amer.	7	..	..	Sl.	Fair.	Incorrigibility and immorality.
17	Eng.	6	Sl.	Sl.	..	Good.	Incorrigibility.
17½	Ger.	5	Sl.	..	..	Fair.	Immorality.
17	Jew.	4	Sl.	..	..	Fair.	Incorrigibility.
16½	Ger.-Am.	5	..	..	..	Fair.	Incorrigibility.
14½	Pa. D.	..	+	..	..	Under size.	Incorrigibility.
15½	Scotch.	5	Sl.	..	Sl.	Good.	Delinquency.
17½	Pa. D.	6	..	..	Sl.	Under weight.	Unmanageable.
15	Amer.	..	..	..	..	Fair.	Incorrigibility.
15½	Irish.	5	Sl.	..	+	Fair.	Incorrigibility.
19	Irish.	4	Sl.	..	..	Under size.	Delinquency and incorrigibility.
14½	Irish.	5	Sl.	..	..	Good.	Incorrigibility.
15	Unk.	5	Sl.	..	..	Fair—Heart disease.	Immorality.
17½	Pa. D.	5	..	Sl.	Sl.	Good.	Received goods under false pretense.
16	Amer.	5	..	Sl.	Sl.	Good.	Fornication.

Av. age, 16.7. Sl.=Slight. +=Marked defects.

five minutes each. The number of the curve corresponds to the number of the individual in each table. No. 8 is an American girl eighteen and a half years of age, with no sense defects and good health. She was committed for vicious conduct. She is very attractive in appearance, full of fun, very capable, but negligent, and fairly untrustworthy, always carefully explaining that she will do better next time. No. 26 (38) is a tall, capable Jewess seventeen years of age, in the fourth grade. She is in fair health, and was committed for incorrigibility. No. 16 is an incorrigible and delinquent American girl of seventeen and one-half years of age, of mediocre ability, in the tenth grade, with good health, and is apparently trying to do her best to do right. No. 35 is fifteen years of age, of unknown parentage, in the fifth grade, with slight eye defect, heart disease, and was committed for immorality. Her curve shows the trend of weaker subjects in general.

The errors consisted principally in the omission or duplication of letters in words, the omission of syllables, or in a few instances the omission of words; in the wrong spelling of words; in the making of wrong symbols; and in the repeating of wrong marks. The less apt girls had difficulty in disassociating 2 from two marks and using it to signify one mark to the right. The thirty-seven girls completing the tests made in all 1264 errors, or an individual average of 2.3. The errors vary from day to day, and tend to persist throughout the series. The eight girls who had an individual average of over 90 substitutions made, respectively, on the average the following number of wrong substitutions: 1.4, 3.6, 4.8, 1.0, .27, 2.7, .62, 3.7.

Aside from the difficulties stated, there are definite situations and conditions which mitigated against progress. Foremost is inattention to the work at hand, and attention to something else. Sometimes the subjects were thinking of a lesson or review which was to follow. One subject who was constantly irritated, and who did not finish the work, wrote:

"Cannot concentrate my mind on the work at hand. Have been thinking of conditions at home. Recd. a letter from

Peter Sandiford

home, the first in nearly a year and the contents is on my mind. Everything distracts me. I begin with a word, my mind wanders off, and I get all mixed up."

Later this subject writes:

"Have gotten into serious trouble which preys on my mind. Do not feel well."

Losses are usually explained by such expressions as:

"Not feeling good," "Sore eyes," "Sore hands," "Hands cold," "Headache," "Tired," "Nervous," "Excited about something else," "Interruption."

The notes show that some of the better subjects focused their attention on helpful variations, but as a rule these were permitted to survive or disappear by chance.

Negro Girls.

The negro girls are much slower to warm up to the occasion, and the first to drop back and lose interest. They are more difficult to enthuse, and cannot be forced or easily stimulated, except temporarily through flattery. Their work is more irregular; some days they will do unusually well, but drop back to the old pace with no explanation, except to say that they are not feeling so well. Their work is more largely controlled by moods. They are suspicious as to the value of the task, and they seem to carry this work along, like their other school work, with vacillating attention. They are partially occupied with the task at hand and partially with a random activity, which consists in mumbling, grumbling, humming or saying original or funny things. This second attitude seems to be a common trait with the race unless consciously inhibited.

The work of these girls is less in amount, less neat and less accurate. The marks are more irregular, and many pay little attention to errors. They frequently skip letters, get into the habit of making an H and an O just alike, and have periods of disregarding the sequence of marks. If an error is made, it is very likely to be carried regularly throughout the whole series. A few of the weaker girls, as stated above, make all the symbols wrong and fall into rhythmic movements, which are repeated regularly throughout the entire series, and seem to be entirely satisfactory to the subjects who are making

TABLE II.—NEGRO GIRLS.

Number of Substitutions, 25,338.
Number of Errors, 1935.
Number of Trials, 454.

No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	Average.
1. Subs.	18	17	29	34	56	50	24	41	41	76	69	43	67	51	74	86	48.5
Errors.	1	..	2	4	..	..	2	..	..	1	..	1	2	1	1	..	.94
2.....	12	10	21	25	27	31	26	23	46	39	77	65	47	41	..	..	35.0
	..	5	16	3	2	4	..	2	12	3	24	9	3	4	..	..	6.2
3.....	15	28	25	37	54	61	71	85	87	100	131	134	103	115	125	122	80.8
	4	2	1	1	..	3	3	3	1	..	1	2	..	5	2	..	1.7
4.....	8	33	25	28	53	56	57	76	55	97	..	..	..	..	..	..	48.8
	..	7	5	..	2	3	1	6	4	..	..	..	..	..	..	..	2.8
5.....	24	53	55	59	77	85	88	88	91	80	113	111	135	128	117	150	90.9
	..	..	2	..	1	..	2	1	1	1	..	1	4	..	2	1	1.
6.....	19	33	37	44	51	77	75	86	81	73	88	87	88	100	88	93	70.0
	..	..	..	1	..	1	..	3	1	..	2	..	3	..	6	1	1.1
7.....	11	30	29	23	43	54	69	58	54	57	76	49	38	69	71	84	50.9
	2	..	..	..	..	2	4	1	..	..	3	..	2	3	2	1	1.3
8.....	8	14	16	21	43	52	46	45	51	50	71	85	75	88	89	121	54.7
	2	9	8	6	4	3	4	..	5	4	..	..	12	5	3	2	4.2
9.....	16	32	33	35	41	43	47	52	56	33	60	90	91	95	71	74	54.3
	2	7	8	9	8	9	6	9	5	3	8	19	12	13	7	12	8.7
10.....	25	30	36	23	17	15	19	34	20	35	43	52	35	41	50	42	32.3
	16	22	6	11	1	..	..	..	..	..	..	1	2	1	2	..	3.9
11.....	24	29	30	27	60	45	48	58	46	50	53	58	61	47	41	44	45.1
	1	..	7	3	2	3	1	1	..	1	..	2	1	..	1	..	1.4
12.....	25	42	26	39	57	50	57	72	70	76	79	59	66	72	70	103	60.2
	..	..	1	..	1	2	..	2	3	..	2	3	2	2	..	3	1.3
13.....	20	33	38	36	38	67	85	65	91	66	100	60	..	..	..	..	58.3
	4	5	7	..	6	4	7	3	7	..	3	3	..	..	..	..	4.0
14.....	27	36	31	36	30	24	35	32	43	41	35	40	47	42	36	..	35.7
	1	2	..	3	..	..	1	1	3	..	1	1	1	..	..	..	.93
15.....	32	32	48	48	58	82	68	83	89	113	88	75	104	112	94	112	77.4
	11	2	..	1	1	..	2	4	1	2	..	..	2	..	..	3	1.8
16.....	20	15	27	43	48	37	63	49	68	66	91	76	95	92	81	120	61.9
	5	6	1	1	2	2	6	..	1	3	6	4	5	1	1	4	3.0
17.....	26	11	26	27	37	45	45	48	60	40	64	67	58	43	49	..	43.1
	1	4	1	1	..	1	3	3	1	1	1	3	3	7	5	..	2.3
18.....	25	34	30	28	55	36	49	43	60	44	58	60	65	93	79	60	51.2
	10	1	..	..	..	..	..	..	..	3	..	..	..	..	9	..	1.4
19.....	17	13	24	26	26	26	36	41	39	48	66	60	58	51	48	39	38.6
	10	7	4	2	4	6	1	..	..	..	..	..	3	..	..	..	2.3
20.....	43	44	50	58	65	47	63	61	74	81	98	84	97	96	73	91	70.3
	39	44	50	58	65	1	..	1	..	2	1	6	..	1	6	1	17.2
21.....	18	37	26	33	40	34	36	27	36	54	35	47	36	..	..	..	35.3
	1	..	..	..	..	..	..	1	..	..	1	..	..	..	..	..	.23
22.....	7	23	41	38	44	33	33	55	47	56	69	101	68	82	56	83	52.3
	7	..	..	..	..	..	..	..	..	..	..	..	1	..	..	1	.56
23.....	24	17	14	13	29	54	52	50	44	59	65	40	..	..	..	..	38.4
	24	5	..	..	1	..	3	..	1	..	..	..	4	..	..	..	3.2
24.....	54	46	50	55	60	78	70	69	59	77	99	101	108	92	50	82	71.9
	54	46	50	55	60	78	70	33	17	7	20	1	13	20	17	8	34.3
25.....	51	48	41	57	69	54	78	82	107	96	115	87	122	122	116	127	85.8
	1	..	..	3	..	..	..	6	..	5	7	4	1	1	6	4	2.4
26.....	33	29	45	43	43	53	84	78	64	88	88	81	90	83	69	74	65.3
	28	8	3	..	..	..	..	2	..	..	..	..	..	..	..	..	2.6
27.....	18	14	19	38	57	54	72	106	75	75	72	74	73	61	69	..	58.5
	17	2	7	1	3	4	1	7	14	2	7	1	5	1	16	..	5.9
28.....	15	11	16	19	29	24	30	37	40	43	54	53	50	39	45	52	34.8
	2	..	1	1	1	1	2	..	4	1	1	1	..	3	1	17	2.3
29.....	14	16	12	35	36	32	23	37	60	42	53	46	..	..	..	..	33.8
	4	6	1	7	2	7	3	6	8	8	5	10	..	..	..	..	5.6
30.....	30	27	41	45	63	42	67	50	90	85	111	90	99	98	74	111	70.2
	2	1	..	1	1	4	3	..	1	1	2	10	2	1	3	3	2.1
Av...	22.6	27.6	31.2	35.8	46.9	48.0	53.9	57.7	61.5	64.7	76.6	71.6	76.0	78.1	72.3	89.0	55.8

(Final average for 30 negro girls, 55.8.)
(Final average for all errors, 4.3.)

Age.	Nationality.	School Grade.	Eye Defects.	Ear Defects.	Tonsils and Adenoids.	Health.	Cause of Commitment.
14	Negro.	4	Sl.	..	Sl.	Fairly good—Heart disease.	Incorrigibility.
16	Negro	4	..	+	..	Good.	Immorality.
15	Negro.	7	..	..	Sl.	Good.	Dependency.
16	Negro.	4	..	Sl.	..	Good.	Incorrigibility and vicious conduct.
14½	Negro.	7	Sl.	Sl.	Sl.	Fair.	Incorrigibility.
16½	Negro.	7	..	..	+	Fair.	Incorrigibility.
14	Negro.	5	..	..	Sl.	Good.	Delinquency.
16	Negro.	5	Sl.	..	..	Fair.	Incorrigibility.
15½	Negro.	4	..	..	..	Fair.	Incorrigibility.
12	Negro.	..	Sl.	..	Sl.	Good.	Incorrigibility.
14	Negro.	..	Sl.	Sl.	..	Fair.	Delinquency.
16	Negro.	4	Sl.	..	Sl.	Good.	Incorrigibility.
14	Negro.	5	..	..	Sl.	Good.	Runaway.
13½	Negro.	..	Sl.	Sl.	..	Fairly good.	Malicious mischief.
(?)	Negro.	4	Sl.	..	..	Good.	Incorrigibility.
17	Negro.	7	..	Sl.	Sl.	Fair.	Incorrigibility.
16	Negro.	4	Sl.	..	..	Good.	Delinquency.
13	Negro.	..	Sl.	..	Sl.	Fairly good.	Incorrigibility.
15½	Negro.	4	Sl.	..	Sl.	Fair.	Lewdness.
15	Negro.	4	Sl.	..	..	Good.	Delinquency.
13	Negro.	..	Sl.	Sl.	+	Fair.	Incorrigibility.
15	Negro.	4	Sl.	..	..	Underw't.	Delinquency.
14	Negro.	..	..	..	+	Convulsion.	Incorrigibility.
16	Negro.	3	..	..	+	Poor.	Unmanageable.
16	Negro.	4	+	..	..	Fair.	Incorrigibility.
16½	Negro.	4	Sl.	..	..	Fair.	Fornication.
16	Negro.	3	Sl.	..	Sl.	Good.	Incorrigibility.
18½	Negro.	2	Sl.	Sl.	..	Good.	Vicious conduct.
(?)	Negro.	..	..	Sl.	Sl.	Poor.	Delinquency.
15	Negro.	4	Sl.	..	Sl.	Good.	Delinquency.

Average age, 15.1.

them. The best group of negro girls rank in general average below the senior group of white girls. The second best group of negro girls in the school rank lower than the second group of white girls, who were among the most inferior in the school. The negro girls do not, as a rule, put as much effort into the work as the white girls, and there is apparently little rivalry among them, although this was occasionally encouraged. If a negro girl was mentioned as being very good, the others whispered something else against her, which seemed —in their mind—to offset any good qualities she might possess in this work.

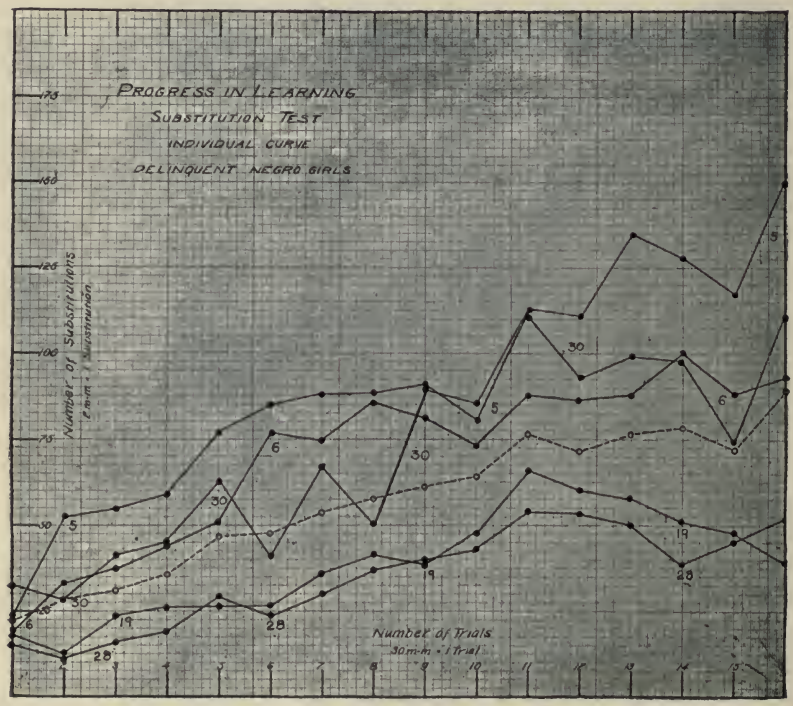


CHART II.—Progress in Learning. Delinquent Negro Girls.

In this chart, No. 5, fourteen and a half years of age, is in the seventh grade, has fair health, with slight eye and ear defects, enlarged tonsils, and was committed for incorrigibility. She is now steady in her work, and probably has the best

mind among the negro girls for intellectual work, according to her teacher's report, and according to her record in these tests. No. 30 is fifteen years of age, has good health, with slight eye defects and slightly enlarged tonsils. She is in the fourth grade, is a steady worker, and was committed for delinquency. She has not been in the school for a period as long as No. 5. No. 6 is the favorite of the school. She is light-colored, very attractive, healthy, the best singer, and one of the most reliable in the group. She is in the seventh grade, fifteen and a half years of age, and has been in the school for about two years. Her offence was incorrigibility. No. 19 claims to be fifteen and a half years of age; she is in the fourth grade, with slight eye defects, slightly enlarged tonsils and fairly good health. Her offence was lewdness. No. 28 is sixteen and a half years old, with slight eye defects. She is in the second grade, and was committed for vicious conduct.

The learning curve (not included among these charts) for the better class of negro girls tends to correspond in its direction with that of the "Senior" white girls. The average age of this group of fourteen negroes is doubtful, but it is probably above seventeen; these girls completed 62 substitutions on the average.

The curve (not included among these charts) for the second group of 16 negroes is similar to that of the larger group of newly committed white girls. There is a plateau (?) between the fifth and seventh trials, and a decided drop from the thirteenth to the fifteenth trials. This may be explained on the same basis as the lower curves for the white girls. The best girls make rapid gains toward the last trials; the poor ones reach their maximum amount of work about the seventh, eighth or ninth trials, and then drop back or continue at the same rate.

In this type of learning it is found that: 1. Comparing the amount of work done by the thirty-seven white girls with the work done by thirty negroes who accomplished more than 50 per cent. of correct results, it is evident that the negroes are decidedly inferior. The white girls made 72.3 substitutions as a general average, the negroes 55.8. The negroes accomplished 62.4 per cent. as much work as the white girls and

made 245.3 per cent. as many errors. Practically all the superior negroes in the school were included in the test.

2. The learning capacity of delinquent negro girls differs quantitatively and qualitatively from that of the white girls, and the educational corrollary follows that different methods of instruction and training are required for the negro girls than for the white girls.

3. Since many of the delinquent adolescent girls included in this investigation are of inferior mentality when measured by a substitution test, this helps to explain their moral deficiencies or causes of commitment. But since a large number of girls of both races have the ability to learn quickly, accurately and extensively, as shown by repeated trials for a given interim, it follows that the moral defects of delinquents must be partially explained on other grounds than inferior mentality.

ORAL AND SILENT READING OF FOURTH GRADE PUPILS.

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Why do our present methods of teaching reading in the grades depend almost entirely upon oral work? If the excessive amount of oral reading done in our schools is ever defended, it is generally on the grounds of the necessity for correct pronunciation, accentuation and expression. And yet correct pronunciation, accentuation and expression can all be taught by oral compositon, by teaching the child to relate stories or connected accounts. This oral composition is sadly neglected. Teachers complain incessantly that their children are unable to stand up and give a clear, connected account of any story or event. May it not be that the child has been so accustomed to read aloud, and therefore to depend upon his book, that he feels at a loss when he is called upon to do anything independently of it?

If we grant that pronunciation, accentuation and expression can be taught as well, if not better, by oral composition than by oral reading, what is there in addition to be learned by oral reading? I believe that not only is nothing to be gained by it, but that it is a direct disadvantage to the child. It is a disadvantage inasmuch as it is teaching him to articulate during the reading process, and is thus helping to form a fixed habit that he carries over into his silent reading.

Now, this habit of articulation during silent reading is one of the chief factors determining the rate of reading. It is almost universal among adults, and it would seem to be most pronounced in the slowest readers and least pronounced in the fastest. I have tried to show elsewhere[1] that it would seem

[1]Psychological Review, March, 1913.

to be a habit almost impossible to eliminate, but a habit that I do not believe to be necessary. If we cannot eliminate it entirely, it would be well not to encourage it, because it is the chief factor in retarding the rate of reading. If the rate of reading can be increased, we have gained much in this age when everybody spends a large part of his time in reading. Rapid, intelligent reading is a thing to be desired. Most practiced readers are able to glance down a page and find out whether there is anything of importance that requires more attentive perusal, but this is an accomplishment that very few ordinary people possess. There are only too many people, college students included, who must read and articulate every word before they are able to comprehend, and this fatal habit, I believe, is fostered and strengthened very largely by our methods of reading in the grades.

It might be objected to all this that articulation is necessary for a child in order that he comprehend what he is reading. That is no doubt to a great extent true, and yet it must not be forgotten that the child has this aid of articulation even when he is reading silently. There is no necessity for him to pronounce aloud to articulate perfectly. It is very doubtful whether the attention paid to pronunciation can compensate for the amount of time lost. Furthermore, it is a question whether the percentage of matter retained or comprehended is increased or diminished by this supposed help of oral reading, or whether the attention paid to the actual formation of the sounds does not detract from the amount comprehended.

The experiments to be described will try to answer this question. They were conducted under my direction by Miss E. M. Aufderheide, a student of mine and teacher of the grade experimented upon. It was the Fourth Grade, and the ages ranged from 9 to 14, with an average age of 10.4 (M. V. = 1.1). Complete experiments were made with 23 children—9 girls and 14 boys. Other children who did not attend regularly during the experiments were eliminated.

The method of conducting the work was as follows: Eight tests for silent reading and eight tests for oral reading were given. Each test consisted of reading as much as possible during a period of two minutes, although the necessity for

reading rapidly was not emphasized. All the children read the same matter. This was taken out of a supplementary reader containing stories out of the Arabian Nights. It was well within the comprehension of the grade. The books were given to the children before each test and taken away afterwards, so that no individual child might be aided in a future test by reading the next story beforehand. For the silent reading the whole class worked at the same time. For the oral work each child was taken individually by the teacher. After each test the children had to write down at once as much as they could of the matter read. Each passage was analyzed in the customary manner into the number of points or thoughts contained in it, and the papers were then graded as to the number of points reproduced.

The table printed below gives the average number of lines read and points reproduced in eight silent and eight oral tests for each of the 23 children:

TABLE I.—*Average Number of Lines Read and Points Reproduced.*

Obs.	Oral Reading.		Silent Reading.	
	Lines.	Points.	Lines.	Points.
B. R.	31	25	32	26
C. A.	20	16	23	19
F. W.	29	22	51	30
A. A.	29	24	41	26
B. A.	24	16	48	24
L. A.	31	18	30	23
R. J.	26	16	29	22
B. M.	19	11	22	19
M. W.	10	9	12	12
G. B.	16	14	25	17
W. D.	30	28	89	22
S. C.	13	6	22	10
H. B.	19	16	22	14
V. W.	18	16	25	14
O. H.	26	18	27	21
R. W.	17	9	19	14
H. S.	9	5	14	6
L. S.	12	8	17	14
C. R.	16	8	18	18
T. S.	15	8	14	12
R. Br.	15	14	25	18
G. H.	24	29	37	17
R. B.	12	6	10	7
Class Totals	461	342	652	405
Averges	20	15	28	18

The maximum number of lines read orally is 31, and silently 89; the minimum numbers are 9 and 10; the average number of lines for the whole is 20 and 28, respectively. Again, the number of points reproduced shows as a maximum 29 orally and 30 silently; the minimum numbers are 5 and 6, and the average points for the whole class are 15 orally and 18 silently.

It would seem, then, that on the whole children can read more silently than orally, even though the usual custom in the grades is to insist upon a great amount of oral reading. But more interesting than this is the fact that they would seem also to retain more of the matter read silently. The oral pronunciation of the words does not help them to retain so much more of the matter read. This is, of course, not obvious from the figures in Table I, because this table shows the actual number of points reproduced. If the child covers more ground during two minutes of silent reading, he ought to be able to reproduce more. We can see from Table I that this is generally the case. Will the child, however, reproduce a greater number of the total possible points of a long passage read silently than of a shorter passage read orally? This is given in Table II, which gives the average percentage of points reproduced for each child:

TABLE II.—*Average Percentage of Points Reproduced.*

Obs.	Age.	Oral.	Silent.	Difference.
B. R.	9	.47	.50	+ .03
C. A.	12	.43	.47	+ .05
F. W.	9	.35	.31	— .04
A. A.	9	.40	.34	— .06
B. A.	11	.33	.33	.00
L. A.	11	.34	.41	+ .07
R. J.	9	.32	.49	+ .17
B. M.	12	.19	.37	+ .18
M. W.	10	.47	.51	+ .04
G. B.	14	.34	.39	+ .05
W. D.	9	.13	.47	+ .34
S. C.	10	.43	.28	— .15
H. B.	10	.38	.41	+ .03
V. W.	10	.35	.35	.00
O. H.	11	.37	.39	+ .02
R. W.	9	.32	.50	+ .18
H. S.	9	.29	.23	— .05
L. S.	11	.28	.55	+ .27
C. R.	13	.25	.50	+ .25
T. S.	12	.27	.36	+ .09
R. Br.	10	.33	.35	+ .02
G. H.	10	.50	.33	— .17
R. B.	10	.36	.32	— .04
	—	—	—	+ 1.79
Averages	10.4	.34	.40	— .51
M. V.	1.1	.06	.07	+ 1.28

The second and third columns show the percentage of points reproduced out of the total number of points contained in the passage read by the child. The figures show the averages for the eight oral and eight silent readings. In the fourth column the differences between oral and silent reading are given, a plus sign indicating superiority in silent reading and a minus sign the reverse. It will be seen that fifteen children show superiority in silent reading, six in oral, and two show exactly the same percentage of reproduction in oral and silent reading. Again, the average percentage of points for the whole class is greater for silent reading.

I think that all this tends to show that children comprehend more when reading silently than when reading orally. The attention is not so divided between the pronunciation of the words and the matter read. My results do not show a very decided advantage on the side of silent reading, and yet I think sufficiently striking when one remembers that these children were accustomed to the usual amount of oral reading in school, and were not, as far as the teacher could tell, great readers outside of school. I am sure that silent reading would show up much better with children who had been taught to read silently in school, and I am sure that if this were done we would be training good readers, instead of training children in the habit of articulation while reading—a habit that retards the reading process and a habit that we have to try to overcome in later life in order to become fast readers.

REPORT ON THE BINET-SIMON TESTS GIVEN TO FOUR HUNDRED AND EIGHTY-THREE CHILDREN IN THE PUBLIC SCHOOLS OF KANSAS CITY, KANSAS.

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Prepared under the direction of Dr. Frank N. Freeman, University of Chicago.

This report includes tests of four hundred and eighty-three children in the public schools of Kansas City, Kansas. The children come about equally from homes of professional people, artisans, skilled laborers, office employees, and day-laborers; they are, therefore, regarded as a very satisfactory group for such a test. They range in chronological age from 6-17 years, and in school grade from the first to the eighth. The chronological age is taken according to Goddard's usage, giving the age at the nearest birthday; thus those from 7½ to 8½ are called 8 years old.[1] This allows the use of the test grade as it stands instead of adding .5 as Terman finds necessary in his method.[2] Except for this device the children rated as Terman does would rank ½ years younger than is shown by my results. The method of reckoning is also the one used by Dr. Goddard.[3] The question as to whether this is a satisfactory method of grading will be discussed later.

The tests of pupils in Grades 1-6 were given individually, while those in Grades 7 and 8 were given in groups. A comparison of the results of these tests shows that they are sufficiently similar to allow massing the data.

I have found in giving the tests that it is necessary to allow as much as thirty minutes for each test. This is not always used, but the attempt to hurry the tests more than this tends to lead to confusion on the part of the child or to the exami-

[1]The Training School, January, 1910.
[2]Journal of Educational Psychology, March, 1912.
[3]The Training School, January, 1910.

ner's assuming that a child cannot do what he might if given a chance. When a child fails continually on test after test if he is conscious of his own failure, as he must sometimes be in spite of the examiner's efforts to encourage him, it is not wise to proceed until he merely fails from habit. But the test should continue so long as there is any chance of the child's giving an answer.

The method of procedure in giving these tests was that described by Dr. Goddard in his report on the revision of the tests.[4] By this system the child is given the mental age of the test in which he answers every question satisfactorily, and then is advanced one year for every five additional questions answered correctly. This makes allowances for individual differences by giving opportunity for selection of questions through a number of tests. However, with a standardization of the tests the need for this becomes less because children tend to answer questions through a given age, and not to select beyond that. It seems to me, however, that the failure to count anything for points less than five is a serious fault in this method of grading which should be remedied. For example, if a child eight years old passes Test VII and four points in more advanced tests, he must still be ranked only VII, or one year below normal.

An attempt to remedy this defect has been made by Terman. He allows a certain per cent. for each question answered, and the sum of these indicates the rank of the child. This seems to me more just and accurate than the method I have followed. Mr. Terman's suggested revision and extension of the tests seems to me well worth thorough proving as giving a more varied and carefully graded test and making provision for more satisfactory tests for children above the twelfth year.[5]

It is well to bear in mind in reading this paper that on account of lack of sufficient tests and of the lack of standardization of those already in use, the data for children above twelve years old, in whatever grade, are not at all satisfactory. This work with children chronologically more than twelve years is of value only for a criticism on the tests themselves.

[4]The Training School, June, 1911.
[5]Journal of Educational Psychology, February, March, April, 1912.

TABLE A.—*Variation of Test Age from Chronological Age.*

Age.	+2.	+1.	0.	—1.	—2.	—3.	—4.	—5.	—6.	Totals.
6.....	3	5	2	..	..	..	..	..	..	10
7.....	2	24	40	1	..	..	..	..	..	67
8.....	2	11	35	14	..	..	..	..	..	62
9.....	..	11	25	19	3	..	..	..	..	58
10.....	1	8	23	12	4	1	..	..	..	49
11.....	..	12	10	13	9	..	..	..	..	44
12.....	..	..	9	27	5	4	1	..	..	46
13.....	..	..	1	17	24	6	3	1	1	53
14.....	..	..	..	..	32	17	4	..	..	53
15.....	..	..	..	..	..	17	12	2	..	31
16.....	..	..	..	..	..	..	2	5	1	8
17.....	..	..	..	..	..	..	..	..	2	2
Totals.....	8	71	145	103	77	45	22	8	4	483

Table A shows the individual variation of the Test Age from the Chronological Age of the children of each age. The first column shows the ages of those taking the tests. The last column gives the number of children of each chronological age. The headings of the columns show the variations from O, the normal. Plus variations signify that a child has passed at a test age greater than his chronological age and minus variations, that he has failed to reach a test age equal to his chronological age.

It will be seen that those chronologically from 7-10 years, the mode is normal, but only with the eight-year-olds is the distribution on either side of the mode nearly equal. Below that age the majority are above normal, and above that age the majority are below normal. The eleven-year-olds are practically normal, the majority coming within one year of normal. Above that the test age is so affected by the inadequacy of the tests as to have no value in establishing a norm. The results of the work on Tests XII seem to prove that it is too difficult for twelve-year-olds.

Table B shows the distribution of the four hundred and eighty-three children in chronological and mental age. The Arabic numbers under "Age" denote chronological age, and the Roman numbers heading the columns denote mental age. The numbers in black face show the normal frequencies. The last column is derived from the table, and shows the Median Test Age for each chronological age.

TABLE B.—*Distribution of 483 Children in Mental and Chronological Age.*

Age.	VI.	VII.	VIII.	IX.	X.	XI.	XII.	XIII.	Totals.	Median Test Age.
6.....	2	5	3	..	..	..	..	..	10	7.1
7.....	1	40	24	2	..	..	..	..	67	7.31
8.....	..	14	35	11	2	..	..	..	62	7.97
9.....	..	3	19	25	11	..	..	..	58	8.78
10.....	..	1	4	12	23	8	1	..	49	9.83
11.....	..	..	..	9	13	10	12	..	44	10.6
12.....	..	..	1	4	5	27	9	..	46	10.98
13.....	..	1	1	3	6	24	17	1	53	11.14
14.....	..	..	..	..	4	17	32	..	53	11.67
15.....	..	..	..	..	2	12	17	..	31	11.58
16.....	..	..	..	..	1	5	2	..	8	11.1
17.....	..	..	..	..	..	2	..	..	2	11.
Totals..	3	64	87	66	67	115	90	1	483	

TABLE C.—*Grade Distribution Related to Chronological Age.*

	Grades.												
	1.	2.	3.	4.	5.	6.	7.	8.		In			Below
Chron.	Normal Age for Grade.								No.	normal	Re-	Ad-	school
Age.	7.	8.	9.	10.	11.	12.	13.	14.	tested.	grade.	tarded.	vanced.	age.
6.....	10	..	..	..	..	..	..	..	10	10	0	0	10
7.....	62	5	..	..	..	..	..	..	67	64	0	3	..
8.....	22	35	5	..	..	..	..	..	62	35	22	5	..
9.....	8	16	27	7	..	..	..	..	58	27	24	7	..
10.....	2	4	19	20	4	..	..	..	49	20	25	4	..
11.....	..	..	7	17	15	5	..	..	44	15	24	5	..
12.....	..	1	1	6	19	19	..	..	46	19	27	0	..
13.....	..	1	3	6	14	17	9	3	53	9	41	3	..
14.....	..	..	..	..	7	8	19	19	53	19	34	0	..
15.....	..	..	..	..	1	3	4	23	31	0	31	0	..
16.....	..	..	..	..	..	..	..	8	8	0	8	0	..
17.....	..	..	..	..	..	1	..	1	2	0	2	0	..
Totals..	104	62	62	56	60	53	32	54	483	218	238	27	10
										45.1%	49.3%	5.6%	

Table C gives for each school grade the distribution with regard to chronological age. The first vertical column shows the chronological age. The numbers at the top of the other vertical columns show the School Grades, and the second horizontal row shows the normal age for each grade. The numbers in black face show those placed normally. In Grades 1-4 the mode is normal, and also in Grade 6. Grade 7 is the only one where there is any great discrepancy. (A discrepancy of one year in the upper grades of our school can easily be accounted for because for only three years have children been

admitted under seven years of age.) However, while the mode is normal, it will be seen that a much larger number are retarded than are advanced in all the grades.

TABLE D.—*Grade Distribution Related to Mental Age.*

	Grades.												
	1.	2.	3.	4.	5.	6.	7.	8.		No. in			Below
Mental	Normal Age for Grade.								No.	normal	Re-	Ad-	school
Age.	7.	8.	9.	10.	11.	12.	13.	14.	tested.	grade.	tarded.	vanced.	age.
VI	3	..	..	..	..	..	..	..	3	3	0	0	3
VII	61	3	..	..	..	..	..	..	64	61	0	3	..
VIII	39	39	8	1	..	..	..	..	87	39	39	9	..
IX	1	17	38	8	2	..	..	..	66	38	18	10	..
X	..	3	15	35	11	2	0	1	67	35	18	14	..
XI	..	..	1	10	34	26	15	20	106	34	11	61	..
XII	..	..	..	2	13	25	17	32	89	25	15	49	..
XIII	..	..	..	..	..	..	0	1	1	0	1	0	..
XIV	..	..	..	..	..	..	..	0	0	0	0	0	..
Totals..	104	62	62	56	60	53	32	54	483	235	102	146	3
										48.7%	21.1%	30.2%	

Table D shows the correlation of the mental age with the normal age for the grade. The arrangement of the table is like Table C, except that the Roman numbers in the first column give the mental ages. It will be noticed that here the correlation is much closer than between the chronological and mental ages as shown in Table B, or between the chronological and normal age for grade as shown in Table C. This seems to prove that the classification in this school follows closely the mental maturity of the child. Considering one year above or below as satisfactory, it will be seen that there is no important variation until Grade 7 is reached, and the sudden drop there is due to the lack of proper tests for determining the mental status of the child. The normal ages for Grades 7 and 8 are thirteen and fourteen years, respectively. Since there are no tests for these years, the children cannot be expected to reach these ages, and, as before stated, the data gained here are of no use except as a criticism on the tests.

TABLE E.—*Showing Relation of Median Grade Age and Median Grade Test Age to Median Test Age.*

Normal Chron. Age.	Derived from— Table B. Median Test Age.	School Grade.	Table C. Median Grade Age.	Table D. Median Grade Test Age.
7.....	7.31	1	7.17	7.3
8.....	7.97	2	8.24	8.21
9.....	8.78	3	9.46	9.1
10.....	9.83	4	10.55	10.4
11.....	10.6	5	12.07	11.00
12.....	10.98	6	12.64	11.44
13.....	11.14	7	13.86	11.55
14.....	11.67	8	14.71	11.68

Table E in the fifth column gives the Median Test Age for each grade. This is derived from Table D.

In Table E the fourth column is derived from Table C, and shows the Median Chronological Age for each grade, the third column indicating the number of the grade.

In Table F are shown the results on each question of each test from all who took the tests. In the first column the Roman numbers denote the test, and the Arabic numbers under each the separate questions. The numbers at the head of the other columns show the chronological ages. In each column the number at the left shows those who passed, and the right-hand number those who failed on the question.

All the children under nine years make a fair record through Test VIII. Suddenly on Test IX there is a marked falling off in the number who succeed. Not only is this so, but the eight and nine-year-olds succeed better on Test X than on Test IX, and the nine-year-olds did better even on Test XI.

These figures make it desirable to look at Test IX rather carefully. A glance at Test IX throughout the report shows that of ten-year-olds about 23 per cent. failed, except on question 5, where 35 per cent. failed. Of the eleven-year-olds on this same test the smallest failure was on question 4—11 per cent. —while on questions 1 and 5, 27 per cent. failed. The number taking the test beyond this is too small to use for proof, but even here there was trouble with 1 and 5 more than once. Naturally, one should not expect that six, seven and eight-year-olds should pass satisfactorily Test IX, intended for nine-year-olds, but the sudden marked increase of failure at

Table F. Report on each question of tests.

Test No.	Chron. Age.	6	7	8	9	10	11	12	13	14	15	16	17	Titles of Tests.
V.	1.....	4-0	12-0	5-0	1-0	...	....	....	....	....	....	....	....	Compare 6 and 15 grams; 9 and 18 grams.
	2.....	4-0	12-0	5-0	1-0	...	....	....	....	....	....	....	....	Copies square.
	3.....	4-0	12-0	5-0	1-0	...	....	....	....	....	....	....	....	Repeats, "His name is John. He is a very good boy."
	4.....	4-0	12-0	5-0	1-0	....	....	....	....	....	....	....	....	Counts four pennies.
	5.....	4-0	12-0	5-0	1-0	....	....	....	....	....	....	....	....	Patience.
VI.	1.....	7-0	40-0	13-1	2-0	1-0	....	....	....	....	....	....	....	Morning or afternoon.
	2.....	7-0	39-1	13-1	2-0	1-0	....	....	....	....	....	....	....	Defines fork, table, chair, horse, mama.
	3.....	5-2	30-10	11-3	1-1	1-0	....	....	....	....	....	....	....	Puts key on chair, brings box, shuts door.
	4.....	6-1	35-5	13-1	2-0	1-0	....	....	....	....	....	....	....	Shows right hand and left ear.
	5.....	6-1	38-2	13-1	2-0	1-0	....	....	....	....	....	....	....	Chooses prettier.
VII.	1.....	10-0	65-0	28-0	7-0	3-0	....	1-0	2-0	....	1-0	....	....	Counts 13 pennies.
	2.....	10-0	58-7	26-2	7-0	3-0	....	1-0	2-0	....	1-0	....	....	Describes picture.
	3.....	9-1	57-8	27-1	7-0	3-0	....	1-0	2-0	....	1-0	....	....	Sees lack in pictures.
	4.....	7-3	48-17	24-4	6-1	2-1	....	1-0	2-0	....	1-0	....	....	Copies diamond.
	5.....	9-1	64-1	27-1	7-0	3-0	....	1-0	2-0	....	1-0	....	....	Names colors—blue, red, yellow, green.
VIII.	1.....	9-1	59-7	60-0	51-0	25-0	12-0	4-0	10-0	2-0	2-0	1-0	....	Compares objects from memory.
	2.....	6-4	31-35	47-13	45-6	24-1	12-0	3-1	8-2	2-0	2-0	1-0	....	Counts backwards 20-1.
	3.....	6-4	46-20	54-6	50-1	23-2	12-0	4-0	9-1	2-0	2-0	1-0	....	Days of week.
	4.....	6-4	27-39	45-15	48-3	23-2	12-0	4-0	9-1	2-0	1-1	1-0	....	Counts stamps 1 1 1 2 2 2.
	5.....	7-3	58-8	56-4	45-6	24-1	12-0	4-0	9-1	2-0	1-1	1-0	....	Repeats 5 figures 4, 7, 3, 9, 5.
IX.	1.....	1-9	3-63	17-45	28-30	29-9	13-5	7-2	6-5	2-1	0-2	0-1	....	Makes change—20c.-4c.
	2.....	2-8	19-47	30-32	45-13	28-9	15-3	8-1	7-4	3-0	2-0	0-1	....	Definitions better than use. See VI, 2.
	3.....	1-9	7-59	9-53	30-28	30-7	14-4	7-2	9-2	3-0	2-0	1-0	....	Knows date.
	4.....	0-10	0-66	7-55	29-29	28-9	16-2	8-1	10-1	3-0	2-0	1-0	....	Tell months in order.
	5.....	2-8	23-43	26-36	23-35	20-17	13-5	7-2	3-8	1-2	2-0	0-1	....	Arranges weights.
X.	1.....	3-7	11-55	19-18	43-8	45-2	25-3	21-1	19-2	20-0	17-0	5-0	2-0	Knows money—1c., 5c., 10c., 25c., 50c., $1, $2, $5, $10.
	2.....	....	....	4-33	16-35	23-24	13-15	16-6	13-8	18-2	15-2	5-0	2-0	Copies design.
	3.....	2-8	11-55	24-13	43-8	40-7	22-6	20-2	16-5	19-1	15-2	5-0	2-0	Repeats 6 figures.
	4.....	....	2-64	17-20	30-21	34-3	23-5	21-1	18-3	20-0	16-1	5-0	2-0	Questions of comprehension.
	5.....	....	1-65	14-23	24-27	34-3	22-6	19-3	17-4	19-1	17-0	4-1	2-0	Use 3 words in 2 sentences.
XI.	1.....	....	1-0	3-6	12-8	29-9	29-10	36-6	46-4	48-4	28-3	7-1	1-1	Sees absurdity.
	2.....	....	....	9-0	20-0	33-5	37-2	42-0	46-4	50-2	31-0	7-1	2-0	Uses 3 words in a single sentence. See X, 5.
	3.....	....	....	0-9	12-8	20-18	31-8	40-2	44-6	48-4	28-3	6-2	2-0	60 words in 3 minutes.
	4.....	....	....	1-8	10-10	18-20	30-9	39-3	43-7	48-4	20-11	5-3	1-1	3 rhymes.
	5.....	....	....	0-9	2-18	8-30	19-20	27-15	37-13	44-8	25-6	7-1	2-0	Arranges dissected sentences.
XII.	1.....	....	....	....	....	5-3	12-17	19-19	18-24	39-14	23-8	6-2	1-1	Repeats 7 figures.
	2.....	....	....	....	....	4-4	7-12	16-22	25-17	39-14	23-8	8-0	1-1	Defines charity, goodness, justice.
	3.....	....	....	....	....	4-4	12-7	21-17	24-18	38-15	24-7	6-2	2-0	Repeats sentence of 26 syllables.
	4.....	....	....	....	....	3-5	4-15	8-30	9-33	11-42	6-25	1-7	0-2	Resists suggestion.
	5.....	....	....	....	....	1-7	8-11	14-24	16-26	23-30	10-21	3-5	1-1	Problems.
XV.	1.....	....	....	....	....	4-11	9-16	10-26	17-25	21-32	10-21	2-6	0-2	Interprets picture.
	2.....	....	....	....	....	2-13	11-14	14-22	16-26	20-33	22-9	1-7	1-1	Changes hands of clock.
	3.....	....	....	....	....	1-14	4-21	4-32	9-33	15-38	11-20	2-6	0-2	Code.
	4.....	....	....	....	3-0	14-1	24-1	36-0	40-2	50-3	29-2	7-1	1-1	Opposites.

this place, together with the difficulty that older children have with this test, seems to show that it is too difficult for this age. There is a greater gap between Tests VIII and IX than between any other two consecutive tests. I am not clear in my own mind as to the reason for this. It is possible that this test is more nearly a test of training than of native ability. However, that could not be true with question 5, arranging weights, on which at seven, eight and nine years more than 50 per cent. failed, and nearly 46 per cent. of ten-year-olds. Questions 1, making change; 3, giving date; and 4, naming months; I do believe were strongly affected by training. A child frequently made the excuse, "I have not learned that yet." Question 2, definitions better than use, gave less trouble to nine-year-olds, only 22 per cent. failing, but the ten-year-olds found it just as difficult as 1 and 4. In Test X, question 2, copying designs gives more difficulty than any other, and seems to be the only one misplaced. Not only the ten-year-olds, but eleven, twelve and thirteen year-olds found trouble here.

By comparison of X 5, and XI 2, constructing a sentence containing three given words, it will be seen that among the ten-year-olds practically all who answered the question at all satisfactorily reach an eleven-year credit, which requires that the three words be used in a single sentence instead of in two sentences, as in Test X. Also, that question 1, absurdities, and 3, sixty words in three minutes, are easier for ten-year-olds than X 2.

Test XII, by the results of this test, seems too difficult for twelve, thirteen and fourteen-year olds, since the best record on any question made by children of these ages is 26 per cent. failures on question 1, repetition of seven figures, and question 2, definitions of abstract terms by fourteen-year-olds. Even fifteen and sixteen year-olds have more than 50 per cent. failures on question 4, suggestibility, and question 5, problems. Test XV 4, is in our schools a test of training, because in Grades 5 and 6 antonyms are taught. This accounts for the fact that so many ten and eleven year-olds passed, and that there were practically no failures on this question. The other questions, as might be expected, are too difficult for twelve, thirteen and fourteen-year olds, and even fifteen year-olds

have a large per cent. of failure. Returning to Test X, question 4, there is a part of this question that seems to me very poorly graded. In series 2, question 3, "Why would you excuse a person for doing wrong when angry more than if he was not angry?" and question 5, "Why would you judge a person more by his acts than by his words?" seem to me much more difficult than any of the other questions, and they proved to be so to the children. Bobertag says that they should be eliminated because even an ignorant adult could not give a satisfactory answer to them.[6]

Table G shows how many children are at, above or below school grade according to chronological age, assuming seven years as the normal for the first grade, eight years for the second, and so on. It also shows the number at, above or below school grade according to the Binet system of measurement. In the latter tabulation I have given the entire result, and the result after taking out those of the seventh and eighth grades. This is done because the normal ages for grades 7 and 8 are thirteen and fourteen years, respectively, and there are no tests for those ages; also to allow comparison with other reports of such work that have not included Grades 7 and 8. A comparison of numbers 1 and 7 shows that while forty-three are above grade according to school standard, two hundred thirty-seven, nearly six times as many, are below grade by the same standard. A comparison of numbers 3 and 6 shows that sixty-four are in grades beyond what their mental ability warrants, while one hundred one are below where their mental ability would place them. This latter is far nearer a normal distribution, since instead of six times as many, as in the first instance, not quite twice as many are retarded as are advanced. Comparing numbers 4 and 6 shows two hundred three in the right grade by school standard, and one hundred forty-seven by Binet standard, a difference of about 5 per cent.

It will be seen that even omitting Grades 7 and 8, a larger number are advanced beyond their normal grade as measured by the Binet scale than according to chronological age (numbers 1 and 3); that a smaller number are in the right grade

[6] Otto Bobertag. Zeitschrift für angewandte Psychologie, May, 1911.

TABLE G.—*Showing Position in School Related to School Standard and to Binet Standard.*

	This report.		Goddard's figures.	
	No.	%	No.	%
1. Above grade according to School Standard. (Table C.)	43	8.8	150	11.6
2. No. in grades ahead of what their mental ability measured by Binet scale warrants. (Table D.)	150	30.9	...	...
3. Same, omitting Grades 7 and 8	64	16.0	121	9.4
4. In right grade according to School Standard. (Table C.)	203	41.9	393	30.0
5. In right grade according to Binet Standard. (Table D.)	233	48.1	...	...
6. Same, omitting Grades 7 and 8	147	36.9	558	43.2
7. Below grades according to School Standard. (Table C.)	237	48.9	659	51.1
8. In grades below what mental ability warrants. (Table D.)	101	20.8	...	...
9. Same, omitting Grades 7 and 8	101	25.3	558	43.2

By Years of Retardation. (This Report.)

	1 yr.	2 yr.	3 yr.	4 yr.	5 yr.	6 yr.
1. Retarded according to School Standard. (Table C.)	150	52	20	5	2	..
2. Backward according to Binet Scale. (Table D.)	103	77	45	22	8	2
3. In school grade below that which their mental ability warrants. (Table D.)	94	7	..	..	..	..

Goddard's Figures for Above.

1. Retarded according to School Standard	361	186	90	22	..	..
2. Backward according to Binet Scale	312	156	79	37	..	..
3. In school grade below that which their mental ability warrants	449	90	8	..	..	..

according to the Binet scale (numbers 4 and 6); and a smaller number are below by this scale (numbers 7 and 9). This result does not agree with Dr. Goddard's findings—that a smaller number are above and below according to the Binet scale, and more in the right grade than according to the chronological scale. His figures are given in columns 3 and 4.[7]

The part of the table showing results by years of retardation gives opportunity for comparisons. While at one year a smaller number are backward according to the Binet Scale than are retarded according to the school system beyond that at two, three, four, five and six years' retardation, more are backward according to the Binet Scale than are retarded in the school system. Here, again, we are at variance with Dr. Goddard's report that shows up to four years' less retardation by Binet than by school standard.

It will be of interest to compare Tables C and D for the purpose of discovering how many children are properly classified chronologically and mentally. Looking at the totals, Table C, we find of four hundred eighty-three children tested, two hundred eighteen, or 45.1 per cent., are in the normal grade; two hundred thirty-eight, or 49.3 per cent., are retarded, while only twenty-seven, or 5.6 per cent., are advanced.

In Table D, showing the grade distribution according to mental age, the totals show of the four hundred eighty-three children tested, two hundred thirty-five, or 48.7 per cent., in the right grade; one hundred two, or 21.1 per cent., retarded, and one hundred forty-six, or 30.2 per cent., advanced. That is, measured by the Binet standard, more are in the normal grade, less than one-half as many retarded, and nearly six times as many advanced as when measured by the Chronological Standard. Goddard's report, above referred to pp. 244-245, shows gradation according to the physical age, 30.4 per cent. in the normal grade, 51 per cent. retarded, and 11.7 per cent, advanced. While the number retarded approximates our findings, there are fewer in the normal grade, and twice as many advanced as we find.

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[7] H. H. Goddard. *Two Thousand Normal Children Measured by the Binet Measuring Scale of Intelligence.* Pedagogical Seminary, June, 1911, pp. 232-259.

The result is very different in comparing the distribution according to mental age. Goddard finds 43.2 per cent. in normal grade against our 48.7 per cent. he finds 42.4 per cent retarded, twice as many as our report shows; while he finds only 9.4 per cent. advanced, where we find 30.2 per cent—more than three times as many. Dr. Goddard places the normal age for the grade one year lower than we have been compelled to use by our school standard, but since the comparison is made in per cents., I do not think this renders the results incomparable.

Our result seems to show, as Dr. Goddard suggests, that the perfection of such a series of tests as this would be of great value for use in the more accurate grading of the children in the public schools. Dr. Goddard's words in the report we are quoting, p. 249, may well apply to this report, "It is almost beyond the bounds of possibility that we could get such figures as are shown in this Table unless the figures upon which it is based are amazingly accurate, and if they are accurate, it gives us a wonderfully valuable method of measuring our efficiency and our accuracy in the grading of children, and points out the possibility of great improvement along this line—much to the advantage of the children and the comfort of the teacher."

With many of our prominent educators working toward this end, we may hope that in the future a system may be worked out that will assist in an accurate grading of our children according to efficiency and maturity in a scientific manner.

SUPPLEMENTARY REPORTS.

1. *Report of the tests of forty "1B" children given within ten days of their admission to school and comparison of the tests of twenty-two of them with tests given six months later when they were "1A."*

The purpose in giving this test was to attempt to learn something of the mental standing of the children before they were affected by conscious, definite training. For this reason the whole class was tested before they had been in school ten days.

The class of forty "1B" children range in age from five-seven years. The tests began with Test VI, and all were carried

through Test IX. Those who showed any sign of further ability were tested on parts of Tests X and XI. The accompanying table shows the age distribution, the Roman numbers showing the age according to the Binet Scale, and the Arabic numbers under age denoting the chronological age.

Age	V	VI	VII	VIII	Totals
5	1				1
6	1	28	5	2	36
7		2	1		3
Totals	1	31	6	2	40

In chronological age all but one, five years old, are the normal age for the grade. In mental age one falls one year below and two are one year above the Ayres' Standard, 6-7. It will be seen, therefore, that the distribution curve is normal, and that the class approximates perfection in this work. By this table it will be seen that three are one year below normal, twenty-nine normal, six one year above normal and two two years above. The part of this class who entered the "1A" group at the beginning of the second term were tested again six months after the first test. Because our compulsory education laws have no effect on children under eight years, many are irregular during their first term, or drop out altogether. For this reason, and because of removals from the district, only twenty-two are available for the comparison.

The following comparisons are made on the basis of the same chronological age for each child at each test. Of three who made no gain in mental age, one was normal, one one year above normal, and one two years above normal. Of fourteen who gained one year, one was one year below normal at the first test and normal at the second test, eleven were normal at the first, and one year above after six months in school, two were one year above at the first test, and two years above at the second. Of the five who gained two years mentally, all were normal at the first test.

This seems to show a very marked influence of training in the first term of school. It might be argued that the first test had prepared for the second. The facts on which I base my opinion that this is not so are these: On the first test only three who took both tests passed Test VII. All were told that they had done well. If any memory influenced the second test,

it would have been one that would have caused failure, yet at the second test fifteen passed Test VII. No one who took both tests passed Test VIII the first time, though they were given to understand that their work was satisfactory, and on the second test three passed Test VIII. At the second test, besides the three who passed the entire test nineteen passed part of Test VIII. At the first test six answered one question on Test IX. At the second thirteen answered one question, and one answered two questions. All except question 1 was answered by some. At the first test no one answered any question on Test X. At the second test five passed question 3, repeating six figures, and one of these passed also question 1, knowing money.

A comparison of the work of twenty-five children on tests given at an interval of one year.

When first tested, early in 1911, the class was "1A." The second test was conducted in the same way by the same examiner early in 1912, when the children were "2A." In 1911 the class consisted of forty children. Fifteen of these were lost by removal, so that only twenty-five were available for comparison.

The object of giving this test was to discover whether anything could be learned as to the mental growth in one year, and its relation to the physical growth.

In the first test, as the children ranged in age from six to nine, I began with Test VI. Eighteen passed Test VII and four passed Test VIII. In the second test I began with Test VIII. Only five failed to pass this test, and all but one of these passed Test VII. The one who failed was a girl who had to take Test V for a perfect record. She had had to do the same at the first test. She showed a gain of one year, but was one year below normal at each test. No one passed Test IX, though eight made a sufficient number of points beyond Test VIII to be ranked nine years, and one, a little girl of eight years, made a ten-year rank.

In comparing the two tests I find that six made no gain in mental age in the year. Of these one was normal at the first test, and failed by one year to equal his physical age on the second test. The other five were one year above normal on

the first test, and normal on the second. Fourteen made the normal gain of one year in mental age. Of these nine were normal in both tests, three were one year below normal each time, one was one year above, and one was two years above each time. Five made a two-year gain in mental standing in one year. Of these one was two years below normal at the first test, and one year below at the second, one was one year below at the first test and normal at the second, two were normal at the first test and one year above at the second.

No attempt has been made in this report to analyze the kind of answers, or to draw any conclusions with regard to the tests themselves. This is treated in the main report, of which this is a supplement.

COMMUNICATIONS AND DISCUSSIONS.

WHAT CONSTITUTES EXPERIMENTAL PROOF? CRITIQUE OF AN OPEN-WINDOW EXPERIMENT.

It has been said often enough not to need reiteration that the essence of experiment is observation under controlled or standardized conditions, and again that experiment aims to replace opinion by objective demonstration. The reason why we use instruments of precision and statistical methods in scientific work is to meet these requirements of control and objectivity.

The movement for open-window classrooms is one of those developments in educational practice that by very novelty stand much in need of real experimental scrutiny. When we make so radical a change as to remove a group of pupils from the ordinary classroom to the open air, we immediately vary simultaneously a considerable number of conditions. Two questions arise: what is the actual effect, mental, physical or moral, of these changes? And which of the altered conditions—temperature, humidity, light, novelty, increased freedom, altered chemical or physiological aspects of the air, and perhaps better feeding—which of these altered conditions are really producing the observed effects?

I have been much struck by the circumstance that those in control of the pioneer open-air classroom—the Charlottenburg Forest School—have given up the idea of conducting regular class exercises out of doors in cold weather and have returned to the use of what is virtually a warmed room. This has led me to read with much interest a recent pamphlet by Dr. W. W. Roach[1] of Philadelphia, which seems to me to exhibit so many methodological faults as to warrant consideration on that score in these columns.

If we are to make real progress in education, we must not merely adopt the outward semblance of experimentation, but follow rigorously the precautions, the checks, the standards of verification and

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[1] *Revitalizing Devitalized Children: An Open Window Experiment.* Reprinted from the *American Journal of Public Health*, Vol. 3, No. 2, pp. 13.

proof that characterize the man of science in the laboratory, or, if that be impossible, we must make clear in what respects our experiments lack conclusiveness and hope for confirmation or correction of our findings by subsequent investigators.

With these thoughts in mind, I trust I shall not be accused of condemning the open-air schools (which I regard as a highly interesting, though not yet sufficiently studied movement), if I venture upon some comments upon the methodological aspects of Dr. Roach's paper.

At the Bache School, Philadelphia, during the winter session of 1912, forty-four third-grade pupils were placed in a classroom with heat cut off (save on very cold days) and with windows as widely open, above and below, as the sashes would permit. Desk chairs were used for routine work, but so arranged as to be readily moved aside by the pupils to clear the floor space for physical exercise. Woolen blankets, sweaters, caps, gloves, etc., were provided for use in very cold temperatures; otherwise the equipment and work of the class were like that of another third-grade class used for comparison and housed in the same building in an ordinary heated classroom. No definite record of the temperatures of the two rooms is given, but apparently the colder room was not allowed to fall much below 50° F. The pupils were not tubercular, nor were they fed at the school. In each room there were a number physically and pedagogically retarded.

Now, the net factual results of this experiment, so far as I can gather them from Dr. Roach, appear to be that in twelve weeks the average gain in weight was for the fresh air room two pounds, for the regular room one pound. If this result be doubtful, the experiment seems not to have *proved anything.*

In the first place this result has no statistical significance. When we are dealing with averages, we must remember that a difference between two averages has claim to scientific standing only when its magnitude is shown to be at least twice as great as its variability. Dr. Roach does not compute the reliability of this difference. He gives a full account of the weight of each child before the experiment, but only their average weight after the experiment, so that we have no idea how the gain in weight was distributed. Since the mean variation of the open-window class before the experiment is, according to my calculations, about 6 or 10 per cent. of the average weight,

60.75 pounds, we may expect that there is considerable variability in the gain of the pupils during the twelve weeks of the experiment.

In the second place, we find (pp. 11 and 12) that the teacher of the "warm room" was "naturally anxious that her pupils should compare favorably in every way with those taught in the open-window room, and the medical supervisor *could not consistently ask her to keep her windows closed* and deny to her pupils the fresh air to which he knew they were entitled, so in the early fall *they also gained in weight* (*!*), *and it was not until cold weather set in late in November that they were in very warm air*" (italics mine). I can gather no other conclusion from this than that the alleged three months' experiment actually lasted about *four weeks!*

And thirdly, we find that the average weight of the two classes before the experiment was: for boys, open-window class 61.04 pounds, warm-room class 64.67 pounds; for girls, open-window class 60.15 pounds, warm-room class 68.41 pounds. Query: should we expect the warm-room class, whose boys averaged 3.63 pounds and whose girls averaged 8.26 pounds more than the open-window class before the experiment began, to gain as much as the open-window class?

So much for the facts about the gain in weight. Evidently they prove nothing. But there are some other features of the article that deserve a word of comment. Take, for one, the declaration of Dr. Roach (p. 8) that: "Expired air at body temperature and exhaled gases at over 90° F., set free in the cold-air room, rise rapidly to the ceiling and pass out the upper window openings, being replaced by the pure air coming in the lower window openings." How precisely was this determined? We have no record in the paper of CO_2 tests of air at different levels. As a matter of fact, this statement is almost certainly incorrect, for whenever accurate tests, as by the Pettersson-Palmquist apparatus, have been made of air at different levels, it has been shown that expired air is immediately diffused in the schoolroom, so that the carbon dioxid quotient is the same near the floor, near the ceiling, and at the breathing line.[1]

Turning to the mental effects of the fresh-air room, we note that Dr. Roach declares (p. 12), after citing the gains in weight, that: "The class work of the fresh-air children has shown improvement in

[1]See, for example, the report made under the writer's direction by W. E. McGowns, *Report on the Hygienic and Sanitary Condition of a Public School Building.* Ped. Sem., 27: 1910, 480-490.

the same marked degree. They enjoy study in the cool air and learn rapidly. *Results show it.*" Directly below this assertion is a communication from Principal W. C. Bishop, in which occur the following statements: "You ask my opinion as to what effect the open windows had upon the mental activity of the children. * * * While the time has been short and the weather unfavorable for exhaustive study, I am of the opinion that as the temperature falls to 50 degrees, day-dreaming on the part of particular pupils decreases and the alertness of the whole class increases. This means better attention and more effective work. *To prove that these conclusions are founded upon fact is a difficult task.*" This statement is not quite in accord with the positiveness of the medical inspector.

There follows a brief statement of three test exercises—learning and writing four lines of poetry, solving four simple arithmetical problems and writing 15 difficult words. "While," concludes Mr. Bishop, "the results can hardly be called a proof of our claims, we believe with our other observations that they are straws that show the direction in which the wind is blowing and shall continue our study of the subject." This reluctance of the principal to place positive insistence on the outcome of these tests is amply justified, as any one will admit, by the fact that, so far as we are informed at least, *no preliminary check tests had been instituted to compare the relative school efficiency of the two classes before the experiment began.*

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SILENT AND CONCERTED LEARNING.

In these days much is heard about 'individual work' in schools and of the futility of the attempts made to teach children in a 'wholesale' fashion. Nevertheless, many an experienced class teacher has almost an affectionate regard for the old practice of collective repetition. Should anyone venture to cast a doubt on the potency of this procedure, its supporters will at once cite the fact that very few teachers ever think of teaching a class a song other than simultaneously; and that 'the poetry for recitation' is most easily learnt by concerted repetition by the whole class. Many cogent reasons can, no doubt, be brought forward to justify this method of teaching certain subjects; and the present limited investigation can only throw a little light upon one aspect of the problem. The question

which prompted this experiment in education was: "Does a class learn a poem more quickly when the pupils repeat it aloud simultaneously or when each pupil learns it silently and independently?"

Method.

The method of procedure resembled that employed by Winch in much of his recent work.[1] A class was divided into two sections of equal ability in learning poetry. This was done on the basis of a preliminary test in learning a poem of twenty lines. The two sections of the class thus obtained, which will be referred to as Sections A and B, were given the first half of a poem[2] to learn, which consisted of twenty-four lines. Each pupil was given a separate copy. Before the pupils were told that they would be expected to learn it, the teacher explained briefly any words and phrases likely to be strange to the class. The pupils in Section A memorized silently, whilst Section B repeated the stanzas aloud in another classroom, so as not to interfere with Section A, as both sections worked concurrently. Eight minutes were given to the upper class (Standard 6, average age 12), and ten minutes to the lower class (Standard 4, average age 10), to learn as much as possible. It was assumed that these periods were short enough to prevent any pupil learning the whole poem set; and this presumption was justified by the results obtained. The pupils were told to learn the poem by the 'entire method;' that is, by reading it from beginning to end and not by concentrating upon one stanza at a time. Whilst this condition could be enforced in the concerted learning, we could not be certain that every child in the 'silent' group adopted this method; but the fact that in the subsequent test they were able to reproduce more of the last stanza than of the intermediate ones seems to indicate that this instruction was generally complied with. After the times specified above, each pupil was requested to write as much as she could remember, and in case a certain stanza, line or word could not be recalled, she should leave a blank and proceed to the next part remembered.

On the next day the method of learning was reversed, Section A memorizing in concert and Section B silently. The latter half of the

[1] See especially WINCH, *The Transfer of Improvement in Memory in School Children*, British Journal of Psychology, January, 1908, and December, 1910; and WINCH, *Mental Fatigue in Evening Schools*, Journal of Educational Psychology, January and February, 1910.

[2] The poem given was "Swinging on a Birch Tree," by Lucy Larcom.

same poem was given, the times were the same, and as far as possible the conditions were similar to those of the previous day.

As the lines of the poem given were short and of uniform construction,[3] the marking presented but little difficulty. One mark was given for each line correctly reproduced, and decimal fractions for those lines only partially recalled—meaning, correctness of words and of their order, being borne in mind when assessing the marks; but no marks were deducted for mistakes in spelling when it was obvious that the pupil had the right word. In order to minimize the possible influence of the "personal equation," all the papers were marked by two persons in consultation.

The above procedure was followed with two girls' classes in an average elementary school, and the results are given in Table I. Other experiments were made with four classes in a boys' school, but all the above conditions were not fulfilled. Thus, no preliminary memory test was given, the class being divided into two sections by taking alternate names on the class list of the most recent examination. Another condition not complied with was that the converse experiment was not performed; that is, the section tested with the silent learning was not tried with simultaneous learning. The time given to memorize was six minutes to St. 4 and 5 and eight minutes to St. 2 and 3. The poem memorized was also different from that given in the experiments previously described.[4] Notwithstanding these differences and deficiencies, we include the results separately (Table II), as they lend support to the more carefully obtained results of Table I.

[3]The following will suffice to illustrate the matter learnt:

Swinging on a birch-tree
To a sleepy tune,
Hummed by all the breezes
In the month of June!

[4]The poem in this case was "The Curfew."

TABLE I.

Maximum Marks: 24.

	Section A.		Section B.	
	Silent.	Concerted.	Silent.	Concerted.
St. 6..... (36 pupils)	18.4 (2.3)[5]	15.7 (1.6)	18.7 (1.8)	14.9 (1.7)
St. 4..... (42 pupils)	12.1 (1.4)	10.8 (.8)	11.4 (1.2)	10.6 (1.3)

TABLE II.

Maximum Marks: 16.

	Section A (Silent.)	Section B (Concerted.)
St. 5..... (34 pupils)	15.4 (.9)[5]	13.2 (2.1)
St. 4..... (32 pupils)	10.5 (1.7)[6]	8.6 (1.1)
St. 3..... (36 pupils)	6.2 (1.8)	6.7 (1.2)
St. 2[7] ..... (40 pupils)	7.0 (1.4)	6.4 (1.7)

Results and Conclusions.

The tables show that in the majority of cases the silent method produced the better results. As there is in the psychological and educational worlds considerable distrust of *average* results,—and rightly so,—it is necessary to supplement them with further data. The papers sent in by the pupils who learnt by both methods were compared. Twenty-five out of the thirty-six in St. 6 (Table I) obtained higher marks when they had learnt silently; nine had better marks with concerted learning, whilst two had precisely the same marks for the two reproductions. Even allowing for the fact that the reproductions were of different stanzas, nevertheless, the majority in favor of silent learning is so great as to add considerable evidence to that of the averages. In St. 4 (Table I) twenty-six of the forty-two pupils obtained better marks after learning silently, fifteen after learning in concert, and one pupil obtained the same marks for both reproductions. In some of the classes, after the children had handed in the papers, the question as to which method they preferred was asked, and in each case where this was done there was a majority in favor of silent work.

It is not difficult to suggest explanations of this result. An important consideration is that there are considerable individual differences manifested in the process of learning poetry. There are differences in rate of learning, span of apprehension, difficulties in understanding the words and phrases, kinds of association, types of

[5]The numbers in brackets indicate the mean variations.

[6]In these cases the average might have been higher had the poem been longer, because some of the pupils reproduced the whole poem correctly, and could probably have learnt more in the time given.

[7]In this class a list of 20 familiar words, *e. g., six, give,* were learnt by repeating the list three times, Section A doing it silently, and Section B simultaneously. One mark was given for each word correctly reproduced, and therefore the maximum mark in this case was 20.

imagery, and many other differences in the numerous factors involved in such a complex process as learning a poem. Concerted learning gives but little opportunity for these differences to operate, whereas in silent work much more scope is given them. Moreover, learning is not the mechanical process which teachers assume it to be. It implies considerable control of attention, and much depends upon a clear apprehension of the subject-matter; and this intellectual part of the work cannot be done effectively amidst the noise and with the fixed speed (making no allowance for individual differences) which concerted repetition involves. Another investigation conducted by one of the writers yielded data which indicated that pupils of the elementary schools complain a great deal about the noisy repetitions of the schoolroom. Pupils show marked preference for quiet lessons, *e. g.*, drawing, needlework, etc., in which, as one pupil puts it, he gets a chance to do things in his own way.

There is one feature of the results given in these tables which lends support to the view that silent work is the more effective because it allows individual differences to come into play. The feature referred to is that the silent learning shows to better advantage in the senior classes; in fact, in one of the lower classes the concerted work gives a better result. This is what might be expected if we bear in mind that the higher the stage of development the greater the diversity of individual differences. This aspect of our results might be interpreted by some as condoning to some extent the use of concerted methods in teaching lower classes. This is an instance of false reasoning, which seems to have been applied during recent years in interpreting many experimental results. The fact that individual differences have not manifested themselves is no reason why we should adopt methods of teaching which retard their appearance. The fact that the seed of the poppy resembles that of the mignonette is no reason for planting them in the same soil and under identical conditions. When we are told that the psychologist can discover but a few fundamental differences between boys and girls of ten, it by no means justifies the view that the same instruction can be given to both sexes without causing intellectual retardation.

Notwithstanding these considerations, our results give some evidence that concerted work does help a certain type of pupil. As already pointed out young pupils find it more helpful than older ones. It was also noted that the girls who gave the best results

with the concerted method (Table I) occupied, as a rule, a low position on the class list. Thus young and backward pupils seem to receive some help from concerted repetition. No doubt, this collective method gives confidence to the diffident pupil, as his failure relative to the rest of the class is somewhat masked; and probably there are other incidental advantages, *c. g.* a more marked rhythm. The advantage of introducing concerted work receives some support from data obtained by one of the writers in a series of experiments in which the amount learnt in six minutes of silent work was compared with that learnt in six minutes when two minutes were given to silent work, two minutes to the concerted method and the remaining minutes to the silent method again. Notwithstanding these advantages of the concerted method, our results urge upon us the conclusion that silent learning should be the predominant method, and concerted learning the exception which might be employed to advantage with young and backward pupils.

Before concluding, it will be well to draw attention to the number of lines memorized by the pupils in the short periods of six, eight and ten minutes. Many pupils learnt on an average two lines a minute, although it must be borne in mind that the lines were not long. The chief condition the teacher has to ensure in order that this remarkably efficient aspect[8] of the child-mind can manifest itself is that the child understands what it is given to memorize. The efficiency of the learning was tested in one of the classes (St. 5, Table I) by getting the pupils to reproduce the poem a week later without any previous warning that they would be requested to do so. The average for the silent work was 15.6 lines and 14.9 lines for the concerted work. These figures imply that many pupils were able to reproduce more after a week had elapsed than on the day they learnt the poem, a feature that has been noted by several experimenters in the past,[9] but which has recently been investigated elaborately by Mr. P. B. Ballard. The fact that the amount of "reminiscence" (not retentiveness) is greater with the concerted work supports Mr. Ballard's general conclusion that the power "to reminisce" is manifested to a greater extent by young and backward pupils.

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[8] Winch's experiments on The Transfer of Improvement in Memory showed incidentally how rapidly and efficiently children could learn poetry by an individual method.

[9] For English children this has been pointed out by Winch in his *Aussage* work, part of which was published in the *Proceedings of the First International Congress of Paidology*, 1911.

THE CONFERENCE ON MENTAL HYGIENE AT BOSTON.

A Mental Hygiene Conference was held in Boston, March 31 to April 4, inclusive, conducted by the National Committee for Mental Hygiene and the newly formed Massachusetts Society for Mental Hygiene. In connection with the conference was an exhibit similar to that given at the Congress of Hygiene and Demography in Washington and in New York and other cities (see the JOURNAL OF EDUCATIONAL PSYCHOLOGY, January, 1913.)

The conference began with addresses by Dr. Paton of Princeton on "Methods of Studying Human Activities," and by President-Emeritus Eliot of Harvard on "The Treatment of the Insane in Any Community," and at the closing session on Friday afternoon Dr. Putnam spoke on "Our Obligation to Understand the Working of Our Own Minds," and President G. Stanley Hall on "Mind and Food," with Dr. Sidgwick of the Massachusetts Institute of Technology presiding.

These addresses suggest the wide scope of the program. Among other speakers were Dr. Tuttle, superintendent of the MacLean Hospital; Dr. Southard, director of the Psychopathic Hospital in Boston; Dr. Fernald, superintendent of the School for the Feeble-minded at Waverley; Dr. Steadman of Brookline, Dr. Orton of the Worcester State Hospital, Dr. Neff, superintendent of the State Hospital at Foxboro, and Judge Baker of the Boston Juvenile Court.

It was noteworthy that, while most of what has been said and written recently on mental hygiene has concerned the pathological, considerable attention was given at this conference to normal mental processes. Dr. Cabot, for example, spoke upon "Four Laws for Mental Hygiene;" Dr. Burnham of Clark University on "Mental Hygiene in the School," and Professor Yerkes on "Hygiene and Mental Development."

The printed program was somewhat elaborate and contained many statements of facts in regard to insanity and the mental hygiene movement, and also gave concrete practical suggestions in brief form for the protection of mental health. The emphasis was placed on prevention and on the training of children. The slogan of the conference was as follows: *"The chief business of society is to evolve adults fit for children to live with."* Among the practical suggestions given were the following:

Train your child to thorough cleanliness both of mind and body. Bad companions as well as common towels, common drinking cups

and the like should be avoided, because there is danger of contagion both physical and mental.

Give your child a variety of well-cooked, wholesome food in ample quantity at regular intervals.

Train your child to healthful habits of sleep in fresh air, giving opportunity for at least nine hours, and for more than that before the age of 12.

Avoid conditions that tend to produce overstrain or precocity. The special business of a young child is to grow and to play with other children.

Give your child opportunity for a variety of wholesome activities and interests.

Train your child to work hard in some regular occupation suited to his ability and talents, but to avoid extreme fatigue by alternation of work and rest.

Train your child to give attention to the present situation and not to worry about the past or the future.

Train your child to strict obedience in a few important matters and let him alone in regard to other things.

Train your child to avoid drugs and stimulants of all kinds.

Protect your child from shocks. Do not frighten him yourself or let other people do so.

If your child becomes worried and sleepless, or has muscular twitchings or the like, consult a competent physician at once.

The best method of training is example; and what is good for your child is usually good for you.

Take advice of a competent person concerning the peculiar, sensitive or nervous child, in order to correct a possibly bad inheritance by proper education and environment.

Try to get a little recreation every day, and a vacation oftener than once a year.

Try to keep your weight up to that regarded as "standard" for your height.

Cultivate a cheerful, generous and charitable disposition.

There are many forms of insanity; a large percentage is preventable, and a considerable proportion curable.

Observe the few well-established and simple rules of health concerning food, sleep, exercise and recreation. Avoid alcohol, drugs, immoral living, venereal diseases, great mental or physical stress and excesses of all kinds.

Be temperate in all things.

WM. H. BURNHAM.
Clark University.

SOUTHERN SOCIETY FOR PHILOSOPHY AND PSYCHOLOGY.

The eighth annual meeting of the Southern Society for Philosophy and Psychology was held at the Johns Hopkins University, Baltimore, on April 8 and 9. Among the papers presented there were three that fell within the field of educational psychology, and so should be of interest to the readers of this JOURNAL. Abstracts of these papers follow:

A Psycho-Educational Study of the Fourth and Fifth School Grades, by Bird T. Baldwin, Swarthmore College.

For purposes of psycho-educational analysis it should be recognized that every child has five interrelated ages: a *chronological age* in years, months and days, denotive of the temporal span of life; a *mental* or *psychological age* denotive of the ripening of certain instincts, capacities and mental traits; a *physiological age* denotive of stages of physical maturity and growth; a *pedagogical age* denotive of the rate and position in school progress; and a *moral or religious age* denotive of fairly well-defined nodes of development in moral judgment and religious awakening. These ages may or may not correspond in their stages of development.

It is the aim of this paper, which is a very brief report of a section of a larger investigation, to inquire into the interrelations of the chronological age, the pedagogical age and the physiological age of normal children. The fundamental questions are: How do children progress through the elementary school? How do children grow and mature physiologically during their elementary school life? What is the relation between these two aspects of development when both are studied consecutively throughout the elementary school?

It must be recognized that since we are investigating the *pedagogical age* and since promotions are based on marks, these records must be taken at their face value, because they represent school practice and because they offer tangible criteria of the efficiency of the individuals and of the school. The progress through the elementary school of the twenty-five boys and the twenty-nine girls followed in this report is based on 10,579 final quarterly term marks.

Some of the main facts are: Girls maintain a higher school standing than boys; there are also more repeaters among the boys and fewer cases of "skipping" a grade. In the fourth and fifth grades the

boys and girls of the group are of approximately the same age, but in the last year of high school the boys are older on the average. Pupils who are relatively poor in the first few grades are relatively poor in the upper grades; that is, poor marks in the early school courses are indicative of low standing throughout the school course. Boys and girls of normal school age or younger maintain a better school standing both as to grades and marks than those over age for grade. The age of entrance after six or seven years determines the age for completing the work of the elementary school. With very few exceptions these children progress through the elementary school at the rate of one grade per year, regardless of the chronological age at entrance. A more careful study of individual marks shows that there are waves or nodes in the marks from year to year for each individual, the most prominent drops coming at the entrance to the high school and in the fourth and fifth grades. The subjects in which the boys do poorest work during the fourth grade are mathematics, penmanship, spelling and manual training; during the fifth grade penmanship, art, manual training, spelling, mathematics. The subjects in which the girls' marks drop back during the fourth grade are mathematics, geography, reading, penmanship and history; during the fifth grade mathematics, art, penmanship, geography and spelling.

A detailed study of the individual growth curves in height, weight and lung capacity, weight-height and vital indices, and periods of physiological changes, shows that the taller and heavier boys and girls, who are also the younger of the two groups of children, mature physiologically earlier than those below medium height. These physiologically accelerated boys and girls complete the work of each grade in the elementary school at an earlier age and with a higher average mark than the short, light or physiologically retarded boys and girls.

The growth curves show there is a correlation between the *decrease in annual increment in growth* in height, weight, lung capacity (and their corresponding indices) and the *lowering in general school averages in school standing during the ages included in the fourth and fifth grades for boys and girls.* What this means will be taken up in a later paper.

A New Test of General Intelligence, By L. R. Geissler, University of Georgia.

This test is intended to provide a continuous and graduated measure of acquired knowledge and native rationality of pupils whose

age ranges between 9 and 19 years. The material consists of two equally long lists of words chosen systematically from the various realms of human experience in such a way that every word on one list is related to a word on the other. One list is hung up before the pupils and a word of the second list is written on the blackboard with the instruction to find some word on the exposed list to which the single word is related, to write down the pair and to give the reason for pairing. Then another single word from the second list is written on the blackboard with the same instruction, and this procedure is continued until the second list is exhausted.

The general intelligence is assumed to express itself in the number of words correctly paired, the fitness of the pair, the number of correct reasons, their fitness, and in spelling, expression, etc. Each of these factors is marked separately, and their total is a measure of the individual's general intelligence. With the valuable aid of Misses Ruth Collins and E. A. Anderson the test has been applied to 62 girls of a preparatory school, whose ages range between 14 and 19 years. The results were correlated according to the Rank-Difference-Method, with those of a general information test devised by Miss Collins, giving a coefficient of .75, with the pupils' ages, giving .57, and with a strength of grip test, using the improved Smedley dynamometer, giving .176 as a correlation-coefficient. The test should be useful in comparing white and colored children and normal and abnormal minds. Its great advantage is the fact that it allows continuity through all grades and minute gradation of all degrees of intelligence within its limits.

A Comparative Study of White and Colored Children by the Binet Tests, By Josiah Morse, University of South Carolina.

This is a preliminary report of a study of the public school children of Columbia, S. C., by Miss Alice Strong. Goddard's 1911 revision of Binet's tests was used. The number of children tested to date is: white, 119; colored, 120. Of the whites 25.2 per cent. tested below age; 42.9 per cent. at age; 28.6 per cent. above age. Of the colored 60.8 per cent. below age; 30 per cent. at age; 9.2 per cent. above age.

The graph for the whites resembles closely that given by Goddard, but that for the colored is strikingly different. The range of individual difference is greater for the latter, but the excess is on the deficiency side. Of the 119 whites one was 3 years below age; seven 2 years below; twenty-two 1 year below; total, 30. Of the 120 colored

one was 5 years below age; one 4 years; eight 3 years; twenty-seven 2 years; thirty-six 1 year; total, 73.

The whites also had one 3 years above age; seven 2 years; twenty-six 1 year; total, 34.

The colored had none 3 years above; one 2 years; ten 1 year; total, 11.

The "near-white" showed the widest variation both above and below standard. Four were so irregular that it was difficult to determine whether to count them with the six-year group, or seven, or eight, or nine. They are therefore grouped as irregular.

From another table it appears that for the colored 60 per cent. of the tests are too difficult; 20 per cent. too easy; 20 per cent. right.

For the white 25.7 per cent. of the tests are too difficult; 25.7 per cent. too easy; 48 per cent. right.

Counting as satisfactory those who test at age, and one year either above or below gives 83 per cent. of whites and 68 per cent. of colored.

Another table yields the following results:

	White.	Colored.
In lower grade according to physical age.....	44.5%	44.2%
In lower grade according to mental age.....	46.2%	15.8%
In right grade according to physical age.....	53.9%	47.5%
In right grade according to mental age.....	42.9%	44.2%
In higher grade according to physical age.....	1.7%	8.3%
In higher grade according to mental age.....	10.9%	40 %

W. C. RUEDIGER, Secretary.

The George Washington University.

THE INSTITUTE FOR EXPERIMENTAL PEDAGOGY AND PSYCHOLOGY OF THE LEIPZIG LEHRERVEREIN.[1]

The Institute for Experimental Pedagogy and Psychology of the Leipzig *Lehrerverein* is a special organization existing within the *Verein*. It was founded in May, 1906, largely under the leadership of Rudolf Schulze, the author of the well-known book, *Aus der Werk-*

[1] A characteristic feature of the development of educational psychology and experimental pedagogy in Germany is the extensive participation in it of teachers both from elementary and secondary schools. These teachers not only take steps to keep themselves familiar with the progress of the movement, but also themselves make active contribution to it. This work is carried on, for the most part, in the various Teachers' Unions. Professor Kohl, who has recently returned to America after spending several months at Leipzig, has been asked by the editors of the JOURNAL to contribute this sketch of the work of one of the best known of these Teachers' Societies.—G. M. W.

statt der experimentellen Psychologie und Pädagogik. Neither the seminary nor the university gave adequate opportunity for work in experimental pedagogy, and it was the aim of the founders to supply this need. In their own words, "The Institute aims to introduce its members into experimental pedagogy and psychology, to give opportunity for independent scientific work in both fields, and to interest wider circles in both sciences." The Institute was begun by private subscriptions and is still so maintained. The membership has grown from forty-seven, in 1906, to nearly two hundred; and, while the greater part of these are teachers in Leipzig, yet there are enrolled teachers from other cities, directors and rectors of schools, students from the university, and men from foreign countries.

At present the institute occupies seven rooms in the *Lehrervereinhaus,* each one well fitted with needful appliances and work tables. While the apparatus is not elaborate, yet the supply is large enough to conduct a thorough introductory course in experimental pedagogy. Moreover, the special investigations conducted by members of the institute ordinarily add valuable materials to the equipment. The selection of books in the library is a most admirable one; and the large use made of these testifies to the deep interest that is taken in the subject.

The institute is thoroughly alive and has been so from the beginning. Dr. Max Brahn, Privatdozent in Leipzig University, is director, and Mr. Johann Handrick is assistant. Both these men give a large part of their time and interest to the institute and almost gratis. Each Monday evening of the school year is set apart for discussions; and here are presented papers on special investigations, reviews of articles and books, and criticisms of methods and apparatus. Outside investigators are often invited to present lectures on their work. The average attendance at these meetings is about twenty, though certain topics often call out a much larger number. These meetings remind one of a thoroughly up-to-date graduate seminar in our universities. A paper is read the first hour and then follows a lively and critical discussion for another hour. The topics are technical and the discussions are pointed and fearless. When the fact is taken into consideration that most of the members present are *Volkschule* teachers who teach six days of the week, we get an index of the interest that exists in experimental pedagogy in the institute.

One afternoon each week for two hours the assistant director conducts an introductory course in experimental pedagogy, where the methods and apparatus of the science are discussed and explained.

The course is virtually a laboratory course of a very high order, since first-hand work is done on school children who are brought to the institute by the teachers taking the course. The aim here is to develop interest and to open problems which members of the class may take up for serious independent investigation. When such a problem is taken up, the director and assistant act as guides and advisers till the work is completed.

In a little over six years the members of the institute have produced four good-sized volumes of publications: three have appeared and the fourth went to press last December. Some of these articles are quite widely quoted in German pedagogical literature. Lindner's investigation on the first language instruction for the deaf and dumb; Freeman's work on attention and number concept in children and adults; Jones' research on the limen for color saturation in children; Watkins' contribution on the relations between intelligence and learning and retention; Block's experiments on the use of the ergograph for measuring fatigue—these serve to show the character of the work done. The ideal of all the work is that of holding rigidly to the scientific method; intensive rather than extensive is the motto. In fact, the ideal is so rigidly adhered to that suggestions for more extensive work, such as those given in Stern's *Die differentielle Psychologie,* are looked upon with extreme skepticism by many of the active members of the institute. The most insistent problem now under discussion by these members is: Shall the institute break from those topics of psychology that admit mathematical treatment, such as sensation, fatigue and movement, and enter the fields where the *Aussage* and questionnaire methods have to be applied? So far the investigations have been essentially in the field of pure psychology on the Wundtian basis; however, the tendency is now to get closer to school problems, particularly to train teachers actually in service and to attack in a scientific manner the problems they face in the places and under the conditions in which they face them. Here is an idea worthy of our attention in this country. We cannot expect all the vital problems of experimental pedagogy to be settled in a university laboratory. Our school clinic idea ought to be widened into an institute for experimental pedagogy and then established in every school system of considerable size.

CLAYTON C. KOHL.

Mt. Holyoke College, South Hadley, Mass.

WHEN SHOULD A CHILD BEGIN SCHOOL? A REPLY TO PROFESSOR STRAYER.[1]

It is usually best to let reviews alone. I speak from sympathy with reviewers as well as with authors, for I have been, I suppose, more reviewer than author myself. And reviewing, at least in England, is badly paid and thankless work. Yet I cannot quite accept Professor Strayer's account of my monograph on the Age of Entry into School. I am not going to complain that he has not emphasized the unique, laborious and protracted nature of the research; because every researcher, rightly or wrongly, is convinced, in his own heart, that his researches are unique, and if he has made them laborious,—well, so much the worse for him. But I *should* like to say that the method is experimental as well as 'statistical,' and that many other important and disputed questions are dealt with besides the intellectual advantage or disadvantage of early entry. Professor Strayer, with greater foresight than my own, *expected* the conclusion which the figures indicated. But in England we are still spending large sums of money every day in virtue of the contrary conviction. We, indeed, have a profound belief in early entry into school, which no evidence seems to shake. Driven from 'intellectual advantage,' its defense entrenches itself behind 'moral advantage,' and expelled from that redoubt once more makes a stand behind 'advantage in the development of the attention.' An attempt has been made to deal with these defenses too, as well as the 'intellectual advantage' to which alone the reviewer refers. I was not, be it understood, an external assailant; for I thought, when I began firing, that my projectiles would defend the forts. Still, that's only England! Yet I seem to remember that, even in America, the most progressive States educationally are those where the entrance age is lowest. So that the question may become very practical even there, some day. And, in any case, my method of measuring school progress weighted for age could not be used to test the value or otherwise of preliminary kindergarten teaching in the large cities of the States. I am sorry I appear to be reviewing my own book; but if the reviewer won't do it, what is a poor author to do? He may, of course, accept the reviewer's omissions as justified; but if he could do that he would probably never have undertaken such a laborious, and from a personal point of view, such a profitless task.

[1]When Should a Child Begin School? By W. H. Winch. Educational Psychology Monographs. Warwick & York, Baltimore.

I did not for one moment suppose that anything 'the schools could do between the ages of three and five could offset differences due to heredity,' though strong environmentalists might think so. That was not my problem. My problem was to find out whether those earlier instructed succeeded better than those later instructed when these groups were of equal intellectual ability. Even in my moments of most exalted educational enthusiasm I have never believed that early school instruction was *more* important than natural ability. The next suggestion of my reviewer is the usual and ordinary suggestion of teachers who read parts of my monograph and omit to read others—it is really a mistake to cut a thing down and make it short as I have done; it lacks literary ease and encourages skipping. The suggestion runs: it all depends upon the system of instruction; *that* is the secret of the whole matter. And then a perfect babel of contrary voices tells us what we ought to do. "How can you expect children who enter school young to be further forward, if they don't begin to read and write any earlier than children who come later?" That's from one side. From another we have: "Of course, they are no further forward if they begin to read and write early! Have you forgotten Pestalozzi and Froebel? The children *must* pass their first school years in kindergarten work if proper progress is to be achieved later on." Well,—England has at present a very elastic educational system and by working in schools which presented very different educational attitudes towards the training of young children and by finding the same result in all of them, I hoped I had given some grounds for the belief that, so far as the ages I dealt with were concerned, the conclusions were independent of the form of teaching adopted. I know that my research has been welcomed by those who don't want any school for children at all before ten years of age or thereabouts. They may be right; but that is not the *conclusion* of the monograph. The *method* of the monograph may be appleid to test the question, if there is an educational system anywhere sufficiently elastic.

Nothing is so interesting to us as our own work, and I am running on and on. I must stop, and some day, perhaps, Professor Strayer will write a book which I—at a moment of pressure—shall read hurriedly; and then—a fitting punishment to me—some one will write and try to demonstrate that I know very little about it.

W. H. WINCH.

Dulwich, London, England.

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EDITORIALS.

STABILITY AND SCHOOL EFFICIENCY.

The most serious and depressing aspect of American education is the instability of the teaching force. When from one-fifth to one-third of the total teaching staff changes every year, it is difficult to see how any efficient solution of school problems is possible. Is there any hope for betterment? A generation ago the supervising force was in the same plight, but today many communities are placing a higher value upon their superintendents. They are making it worth while to remain in service, they are encouraging scientific studies of school conditions, and are rewarding faithful and intelligent performance of duties. A striking instance of this is seen in the recent action of the School Board of Kansas City, Mo. Superintendent J. M. Greenwood, one of the veterans of school administration in this country, and a careful and conservative student of school affairs, handed in his resignation on May 15 after thirty-nine years of service. The resignation was accepted, and Mr. Greenwood was then elected adviser to the board at his presnt salary of $4500, with the understanding that he be relieved of all routine work and devote half his time to the investigation of educational problems. May the day soon come when communities will sufficiently appreciate the value of good teaching to take a similar attitude toward the rank and file of their teachers.

J. C. B.

NOTES AND NEWS.

President Garfield of Williams College has laid before his board of trustees a unique plan for a summer graduate school for the study of the humanities. The plan proposes that scholars of international reputation be invited to deliver lectures in Williamstown from the middle of July to the first of September, that the lectures be widely advertised, and that invitations be issued to a selected list of possible hearers. The lecturers would be liberally compensated, and the lectures would be open to all who desired to attend them. No credits would be given, but all the work would be on a strictly graduate plane. In this way a great service could be rendered to higher education in America, and a plant valued at nearly $2,000,000 would no longer lie idle one-fifth of the time.

President Nichols of Dartmouth College, who has been advocating all over the country that colleges devote themselves more to efficiency in education, has induced his faculty to attack the problem practically by issuing a little book containing a complete study of the curriculum and a careful analysis of the material taught in each course. The object of the booklet is to start men right from the beginning of their course toward the work they have chosen, and to make their college work of the greatest possible service to them.

How slowly and with what great pains the world moves! At the same time that directors of physical training are exerting themselves to the utmost to introduce folk-dancing into the schools, the State Legislature of Iowa is considering a bill to prohibit dancing of any sort in the public schools or in societies whose members are pupils in the public schools. Is this an attack upon what are considered the evils of high school fraternities?

Prof. W. F. Book, who was called from the University of Montana last fall to the newly created chair of educational psychology at the University of Indiana, has accepted the position of deputy State superintendent to take charge of the vocational work provided for in the new law relating to vocational education in Indiana. Superintendent A. O. Neal of Kokomo has been appointed to fill the newly created position of high school inspector.

PUBLICATIONS RECEIVED.

(Notice in this section does not preclude a more extended review.)

ALFRED BINET AND TH. SIMON. *A Method of Measuring the Development of the Intelligence of Young Children.* Translated from the French by Clara Harrison Town, Ph.D. Second edition. Chicago, Ill.: Chicago Medical Book Co., 1913. Pp. 82, and 21 plates. $1.00.

It is significant of the interest in the Binet-Simon tests that the first edition of this translation of the directions for their application was exhausted in less than a year. The present edition is printed on a larger page and makes a much better appearance. As the authoritative and final form of the tests the monograph will doubtless continue to be in great demand.

LOUISE STEVENS BRYANT. *School Feeding.* Philadelphia: J. B. Lippincott, 1913. Pp. 345. $1.50 net.

This is a book of great importance for practical school administrators. It brings together in untechnical form widely scattered data on the history of the movement for looking after the physical condition of the child, and gives a detailed account of the various experiments that have been tried in this country. The extensive bibliography and the practical appendices constitute an important part of the work.

BIRD S. COLER. *Two and Two Make Four.* New York: Frank D. Beattys Company, 1912. Pp. xiii, 248.

A series of historical, sociological and philosophical papers clustered around an arraignment of the public schools on the charge of lack of righteousness. This is due to the godlessness of the schools, and the outcome is a eulogy of Catholicism as a teacher of morals.

STEPHEN SHELDON COLVIN AND WILLIAM CHANDLER BAGLEY. *Human Behavior: A First Book in Psychology for Teachers.* New York: The Macmillan Company, 1913. Pp. xvi, 336. $1.00 net.

For the teacher as perhaps for no other is it important to consider the facts of mental life from the standpoint of behavior. In this text an effort has been made to select topics closely related to the work of teaching, to treat these topics concretely with a wealth of illustration, and to simplify terminology without sacrificing accuracy. Emphasis is laid upon instinct and habit, feeling and emotion, memory and economical learning. The final chapter on behavior and the higher thought processes is a valuable discussion of this much neglected topic.

MINNA G. COWAN, M.A. *The Education of the Women of India.* New York: Fleming H. Revell, 1912. Pp. 256. $1.25.

A painstaking, unbiased account of the present status of women in India, with an analysis of the three forces, Government, Indian and Missionary, contributing to their education. A clear and illuminating account of the present situation in India.

GEORGE E. DAWSON, PH.D. *The Right of the Child to be Well-Born.* New York: Funk & Wagnalls, 1912. Pp. 144. 75 cents net.

Can the desire for worthy parenthood be inculcated, or is it an instinct which manifests itself in inverse ratio to intelligence? Judging from the conversation of educated men and women on the subject, we are still far from the attitude of serious thoughtfulness which the biological gravity of the situation demands. This little book makes a popular but earnest appeal to intelligent people for a serious consideration of the problem of bringing a sufficient number of the right kind of children into the world.

Exceptional Children in the Public Schools of New Orleans. (A Report of the Committee of the Public School Alliance). New Orleans: The Public School Alliance, 1913. Pp. 36.

The report consists of a brief account of recent movements and present activity in New Orleans and makes five groups of constructive suggestions. The work has consisted of the instruction of prospective teachers of exceptional children, studies of individual cases, and a general census of the exceptional children in the city. This last, which is reproduced as Appendix I, classifies all exceptional children as (1) feeble-minded, (2) backward, (3) gifted, (4) incorrigible and (5) physically, but not mentally defective. There are several subdivisions of four and five, and the sexes are listed separately. This census is confessedly preliminary. Its merit would seem to be chiefly that of calling attention to the problem and of culling out the *minimal* numbers of each type of exceptional children. Its chief defect is that it had to be prepared by the co-operation of teachers without expertness for the work.

PROF. DR. SIGMUND FREUD, LL.D. *The Interpretation of Dreams.* (Authorized translation of third edition, with introduction, by A. A. Brill, Ph.B., M.D.). New York: The Macmillan Company, 1913. Pp. xii, 510. $4.00 net.

To psychiatrists and psychologists the *Traumdeutung* is known as Freud's greatest work and probably also his most important, because in it he sets forth at length his method of psychoanalysis. To the general reader Freud is probably known as a promulgator of new

and startling theories of the origin and significance of dreams, wit, humor, the various neuroses and many forms of emotional disturbance that are related by him in some mysterious way to sex. To both classes of readers, the professional and the non-professional, the fact that this translation has been made should be of great significance, because the original presented great difficulties, even to ordinarily competent readers of German—a circumstance that makes all the more meritorious this excellent translation.

The reader will find further comments on Freud's position in this JOURNAL—1: p. 35, p. 497; 2: p. 465; 3: p. 241 and 340.

CLARENCE TRUMAN GRAY, A.M. *Variations in the Grades of High School Pupils.* Educational Psychology Monographs, No. 8. Baltimore: Warwick & York, 1913. Pp. 120. $1.25.

Professors Strayer, Dearborn and others have recently called attention to the value that would accrue to education from a scientific study of the data already available for the investigator in the form of school marks. In the present monograph Mr. Gray presents a careful study of high school marks from the point of view of their variability and the factors which underlie the variations. He concludes that if teachers would make a scientific study of marking systems and of the distribution of grades the variations in marks would be strikingly decreased.

LAWRENCE J. HENDERSON. *The Fitness of the Environment.* New York: The Macmillan Company, 1913. Pp. xv, 317. $1.50 net.

The sub-title of this interesting book is "An Inquiry into the Biological Significance of the Properties of Matter," and its author is assistant professor of biological chemistry in Harvard University. In many biological discussions so much emphasis is laid on the fitness of the organism to the environment that the fact is overlooked that fitness is a relationship involving the environment just as essentially as the organism. The most important factors in the fitness of the environment are water and carbonic acid.

WILLIAM JANDUS. *Social Wrongs and State Responsibilities.* Cleveland: Horace Carr, 1913. Pp. 143. $1.50.

A radical attack upon the present theory of property. "It should require no argument to prove that industrial equity is incompatible with the private ownership of economic fundamentals." "Public expediency demands the socialization of all natural monopolies."

M. F. *A Valiant Woman: A Contribution to the Educational Problem.* New York: Thomas Y. Crowell Company, 1912. Pp. xiii, 303. $1.00 net.

Under the form of a biography of a quiet, clear-sighted, warm-hearted teacher the author attacks and ridicules some of the foibles and weaknesses of our modern school practices. The style is graceful and trenchant, and there is evidence of wide reading of the educational classics, but the spirit of earnest scientific study of educational problems has passed so lightly over the pages as to leave not the slightest trace of its existence.

Elizabeth McCracken. *The American Child.* Boston: Houghton Mifflin Company, 1913. Pp. xxiv, 191. $1.25.

This freshly written, charming little book admits one to the life of the child as it actually exists in the better class American home. In these days of indiscriminate carping and fault-finding with children and education it is a satisfaction to come upon a book that cheerfully and optimistically portrays the good in our modern conditions. Every elementary school teacher should not only read this book herself, but should have a copy at hand to read extracts from it to those who find it difficult to lay aside their blue spectacles.

Ernest C. Moore. *How New York City Administers its Schools.* Yonkers, N. Y.: The World Book Co., 1913. Pp. xi, 321.

This is undoubtedly the most interesting volume on school administration that has appeared in many years. Professor Moore was the member of the Hanus Commission whose task it was to investigate the duties and functions of the Board of Education of New York City. Contrary to expectation, Professor Moore found and reported that the Board of Education had been illegally coerced and hampered in its work by other parts of the city government. The report was, therefore, not pleasing to the authorities, was "rejected," and is here published in book form. Would that it might be read by every member of a school board!

C. Lloyd Morgan. *Instinct and Experience.* New York: The Macmillan Company, 1912. Pp. xvii, 299. $1.50 net.

All recent studies in educational psychology indicate the importance of inherited tendencies in the educative processes. Textbooks in education are laying increased emphasis on instinct and its modifications. The present discussion of instinct and experience by that veteran student of behavior, Professor Morgan, will be welcomed by all educators and psychologists, especially since the author includes a critical examination of the views of Bergson, Driesch and McDougall.

FRIEDRICH MUELLER. *Aesthetisches und ausseraesthetisches Urteilen des Kindes bei der Betrachtung von Bildwerken.* Leipzig: Quelle und Meyer, 1912. Pp. 94. Mark 3.

An important experimental study of judgment in children and adults. The author advocates specific training in esthetic judgment, coupled with adequate instruction in drawing and in the synthetic description of pictures. The connection between rational judgment and class standing is not close.

SCOTT NEARING, PH.D. *Social Religion.* New York: The Macmillan Company, 1913. Pp. xvii, 227. $1.00 net.

"While misery remains in the land; while men are condemned to underpay and overwork; while women are forced into prostitution, and children are compelled to labor, there will be need for a Social Religion." A scathing arraignment of the attitude of church religion toward some of the burning questions of the day.

MAURICE PARMELEE, PH.D. *The Science of Human Behavior. Biological and Psychological Foundations.* New York: The Macmillan Company, 1913. Pp. xvii, 443. $2.00 net.

A better and more descriptive title for this book would be "The Evolution of Social Groups." It is dedicated to "three master investigators, Jacques Loeb, H. S. Jennings and Charles S. Sherrington," and gives a clear and well-knit account of the increasing complexity of behavior from the simplest organisms to man. Among the topics considered are reflex action and the functions of the nervous system, the relations of instinct and intelligence, conscious personality in its bearing upon social relations, insect societies, vertebrate societies, and the factors of social evolution in man.

L'ABBÉ C. PIAT. *La personne humaine.* Second edition, revised and enlarged. Paris: F. Alcan, 1913. Pp. xv, 404. Fr. 7.50.

In discussing the nature of human personality the author first considers the data of perception, those directly given in consciousness, and those gained indirectly through scientific investigation. Here the phenomena of successive and simultaneous dissociation are reviewed. In book two he treats of reflection and the different theories that have been offered in its explanation, and in book three he deals with the idea of responsibility.

HELEN C. PUTNAM, A.B., M.D. *School Janitors, Mothers and Health.* Easton, Pa.: American Academy of Medicine Press, 1913. Pp. 200. $1.00.

In the current discussions of school hygiene and sanitation too little attention is paid to the importance of carefully following up the work of the janitor. Perhaps the best and most effective way of

doing this is through the organized activity of the mothers' clubs. Dr. Putnam sets forth in direct, untechnical fashion what may be accomplished by this means for the health of school children.

J. M. Rice. *Scientific Management in Education.* New York: Hinds, Noble & Eldredge, 1913. Pp. xxi, 282.

Dr. Rice's claim to the title of pioneer in educational research in America is generally admitted, and his articles on the economy of time, on the futility of the spelling grind, and on measurement of results in arithmetic have been the starting point of many subsequent investigations. It is a service to the cause of education, therefore, to have these twelve papers collected and reprinted in book form, so that they may be more generally accessible.

J. Morris Slemons. *The Prospective Mother.* New York: D. Appleton & Co., 1912. Pp. xiii, 343.

In these days of practical eugenics and personal hygiene the period of infant gestation has not received the attention it deserves. The tales and admonitions that are handed down from one generation of women to another contain much of superstition and grotesque fancy. The intelligent woman of today is not satisfied with this, but wants to be told in simple, understandable language just what is taking place and what she can do to further the welfare of the unborn child. This demand is admirably met by the present book. Written by an associate professor of obstetrics at Johns Hopkins, it has all the authority of the medical profession behind it, yet the style is clear and untechnical and the discussion can be easily followed by any one of moderate intelligence.

Ellen Yale Stevens. *A Guide to the Montessori Method.* New York: Frederick A. Stokes Company, 1913. Pp. xii, 240. $1.00 net.

An interpretation of the Montessori Method for American mothers and teachers, with practical directions as to how to apply it, and a coherent explanation of its psychological basis. It is an interesting supplement to Montessori's book, and presents the views of a successful American teacher.

George Drayton Strayer and Edward L. Thorndike. *Educational Administration: Quantitative Studies.* New York: The Macmillan Company, 1913. Pp. xii, 391.

The present volume might almost be said to constitute a source-book in scientific studies of education, although the authors make no pretense at including work done outside Teachers' College. Yet it is more than a mere source-book, for the results of the studies are condensed, explained and related in such a way as to greatly facili-

tate the work of the student in familiarizing himself with the most important investigations in school administration. The material is arranged in five parts, including studies of the students, of the teaching staff, of the organization of schools and courses of study, the means of measuring educational products, and school finance.

HERBERT E. WALTER. *Genetics: An Introduction to the Study of Heredity.* New York: The Macmillan Company, 1913. Pp. 272. $1.50 net.

"An attempt has been made to summarize for the intelligent but uninitiated reader some of the more recent phases of the questions of heredity which are at present agitating the biological world. It is hoped that this summary will not only be of interest to the general reader, but that it will also be of service in college courses dealing with evolution and heredity." We have been very favorably impressed with this book from our preliminary inspection.

EDWARD J. WARD, Editor. *The Social Center.* New York: D. Appleton & Co., 1913. Pp. xi, 359. $1.50 net.

In view of the fact that some of the material in this book was written by others, Mr. Ward lays claim only to the modest title of editor, yet the volume is altogether the outcome of his thought and personal activity, and the other contributors would be the first to recognize his inspiration in their work. A very complete account of the wider uses of the school plant.

EDWARD E. WEAVER, PH.D. *Mind and Health.* New York: The Macmillan Company, 1913. Pp. xv, 500. $2.00 net.

This book is "an examination of some systems of Divine Healing," and contains an introduction by President G. Stanley Hall. Inasmuch as there is a strong tendency on the part of religious bodies to make non-medical healing a part of their work, and because this is done without a thorough knowledge of medicine or psychology, there is urgent need for the examination of this professed healing." Seven chapters are devoted to a discussion of psychotherapy and religious reality; these are followed by a consideration of Christian Science, the Emmanuel Movement, Doweyism, the Christian Alliance, and Metaphysical Healing.

WILHELM WUNDT. *An Introduction to Psychology.* Translated from the second German edition by Rudolf Pintner, M.A., Ph.D. New York: The Macmillan Company, 1912. Pp. xi, 198. 90 cents net.

This little volume is a popular introduction to the Wundtian psychology, and in its five chapters treats of consciousness and attention, the elements of consciousness, association, apperception and the laws of psychical life. It is not intended to take the place of the *Outlines of Psychology,* but merely to give a bird's-eye view of the field.

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PRELIMINARY STUDY OF THE RELATIVE EFFICIENCY OF INDUCTIVE AND DEDUCTIVE TEACHING OF LOGICAL REASONING.

FELIX SACHS.

(Communicated by G. M. Whipple.)

Studies from the Cornell Educational Laboratory, No. 15.

I. Introductory.

This experiment is an outgrowth of two lines of interest, the one psychological and theoretical, the other pedagogical and practical.

In an interesting discussion of the doctrine of formal discipline[1] Professor, now President Meiklejohn has held that the result of training along a specific line of activity is to develop certain 'patterns' or 'forms' of thought, which may thereafter function to advantage in other and different specific activities. "For the empirical science of logic the term 'form,' as applied to our intellectual processes, indicates a common element, or a series of common elements, in those processes, which makes the theory of formal discipline at least intelligible and apparently tenable as a doctrine of intellectual training" (p. 132). In passing from one activity to another, then, the content would be changed, but a certain way of handling this content might be common to the two activities. One naturally thinks

[1] *Is Mental Training a Myth?* Educ. Rev., 37, Feb., 1909, 126-141.

of the various forms of reasoning, the valid forms of the syllogism, as illustrative of these forms of which Meiklejohn speaks. One thing, then, that we had in mind in this experiment was to see whether practice in detecting different fallacies of reasoning in a considerable number of concrete cases would, or could be made to, build up *inductively,* in the minds of our observers a number of patterns of these fallacies, and in such a manner that, when these fallacies recurred in other settings and other material, they would be speedily detected, subsumed under the 'forms' and thus mentally 'ticketed,' as it were. We hoped, also, to get some introspective account from the observers of the genesis and nature of these forms, if so be they were developed and were accessible to their introspection. This hope, it may be said at the outset, was not realized—whether from error in our method or incapacity of our observers or from actual impossibility of the task, we cannot say.

Secondly, as our plan of experimentation really suggested such a course, we were interested to compare the ultimate capacity of our special group of observers to detect fallacious reasoning with the capacity of a second group of observers who had not had our special inductive training, but who had had the regular course in formal logic given in the University. On this, the pedagogical and practical side of the experiment, we had, then, in a small way, an opportunity to test the relative efficiency of inductive and deductive teaching.

II. General Plan of the Experiment.

There were two groups of observers: Group I had never studied logic; Group II had finished a course in logic, including about 48 hours of classroom exercises covering "the general character of the thinking process, its laws of development and the methods by which thought actually proceeds to solve the problems presented to it, together with the analysis of logical arguments and the detection of fallacies." Group I, the 'tutored' group, was given a special drill (about 20 hours in all) in detecting some twenty characteristic forms of fallacious reasoning. This drill was virtually in two periods. In

the first, or learning period, one or two examples of each fallacy were presented and explained from concrete material, and the name of the fallacy was given as a 'label.' In the second, or drill and review period, the same fallacies were reviewed, while a number of valid bits of reasoning and a few more examples of the original fallacies were added for further practice. Finally, both the 'tutored' and the 'class-taught' group of observers were submitted to a long series of test-examples, and were carefully graded on their ability (1) to detect fallacies, (2) to explain the nature of the fallacies detected, and (3) to designate those fallacies by their logical name.

III. The Observers.

The observers of Group I, who had never studied logic, were Mr. *C*, a freshman in the College of Law, Miss *G*, a sophomore, and Mr. *B*, a junior in the College of Arts and Sciences.

The observers of Group II, the 'class-taught' group, were Miss *Ad*, a senior who had taken logic three years ago, Mr. *Mt*, a senior who had taken logic two years ago, Messrs. *Sc* and *Hl*, juniors who had taken logic one year ago, and Messrs. *Wn* and *Fr*, who had just completed the course in logic.

Care was taken not to have the students in either group, particularly the 'tutored' group, of very greatly superior ability to the other group. We took pains to compare the ability of the observers of both groups from their class standing, the judgment of the instructors in the university, and from personal impression. There is positively no doubt that at least three of the 'class' group are equal and probably superior in general ability to any one of the 'tutored' group.

IV. The Tutoring of Group I.

Examples of the following fallacies were collected—Undistributed Middle, Illicit Major, Illicit Minor, Negative Premises, Denying the Antecedent, Affirming the Consequent, Imperfect Disjunction, Composition, Division, Accident, Begging the Question, Dilemmatic Fallacy, Irrelevant Conclusion, Non Sequitur, Careless Use of Language, Disregarding Negative

Instances, Post hoc ergo propter hoc, Hasty Generalization, False Analogy, and Individual Prepossessions. Some of these, such as Irrelevant Conclusion and Individual Prepossessions, include sub-forms, but in these cases the general name was commonly used instead of the particular name. Either designation was considered correct in the tests. Thus we see that there were about twenty types.

Each of the 'tutored' group, as before stated, was given about 20 hours' instruction. This instruction was for the most part given to two or all three together, but in part individually. (We might here state that about 18 hours is given to the study of fallacies in the regular course.)

In order to make clear what is meant by teaching in an inductive way from the examples themselves, we may show how one case was treated. The instruction was as follows:

Example written on the blackboard:

If the strike has been called off, the men are back at work.
The strike has been called off.
Therefore, the men are back at work.

"Is this argument valid?" "I think it is." (At this point we defined antecedent and consequent). "What does the second premise do?" "Says that the antecedent is true."

Second premise now changed to read:

The strike has not been called off.

"Can we conclude that the men are not back at work?" "No." "Why not?" "Because the strike might be only one of a large number of things that would keep the men from going back to work. They might be back for some other reason, even though the strike was not called off."

Second premise now changed to:

The men are back at work.

"Can we conclude that the strike has been called off?" "No, the men might be back for another reason and the strike might still be on."

Second premise now changed to:

The men are not back at work.

"Can we conclude that the strike has not been called off?" "Yes, for if the strike *were* called off the men *would* be back at work according to the first premise."

"In what cases did we get a wrong conclusion?" "Where the second premise was either

(a) The strike has not been called off, or
(b) The men are back at work."

Now the observers were told that (a) was called the Fallacy of Denying the Antecedent and (b) the Fallacy of Affirming the Consequent.

In a manner somewhat similar to this we took up the other examples. We got the observers to understand each fallacy by carefully considering a typical example of it and noting what was wrong in this example. Then we gave them in each case the name of the fallacy which the type illustrated. This concluded the first period of the instruction.

In the second, or drill and review period, as has been explained, we took the typical examples which had just been used, added to them a number of examples of valid arguments and a few more examples similar to the typical ones. We asked each observer to state three things with regard to each of these examples—(1) Valid or Not, (2) Reasons, (3) Name of Fallacy (if any).

These examples were given to the observers until each of them could tell wherein the trouble lay, and could name the fallacy that the type illustrated. After they knew all of them, without regard to the order of presentation, we were ready to introduce the final test-examples.

V. The Final Testing of Both Groups.

The collection of suitable material for these tests was no easy task. We wanted instances of all the fallacies, but it was necessary to avoid those that were over-technical in their content: persons without knowledge along certain lines, chemistry, for example, could not be expected to detect a fallacy in an argument full of technical terms. Many examples had to be discarded for this reason alone. Then, again, economy of time and a desire to avoid too great complexity caused the rejection of numerous lengthy examples. However, eventually, 92 satisfactory concrete examples of reasoning were collected[2] and typewritten on separate cards. Lack of time com-

[2]About 30 were taken from newspapers, magazines, and personal experience. The rest were drawn from Creighton's *Logic*, Bode's *Logic*, and Lafleur's *Illustrations of Logic*. Many of these examples were also originally discovered by the authors just cited in newspaper and magazine articles.

pelled us to relinquish our original intention of giving all 92 test-examples to each observer: we did, in fact, give all these examples to Group I, but for Group II we selected 45 of the examples, and in such a manner that 6 were valid and 39 fallacious, and that each of the 20 fallacies previously cited was represented by at least one example.

In making this final test, the same instructions were given to each observer: he was asked to state with regard to the example before him: (1) valid or not, (2) his reasons for calling fallacies any argument so adjudged,[3] and (3) name of the fallacy, where the argument was adjudged invalid. We recorded the time taken from the beginning of reading each test-example to the end of the observer's report upon it, although we warned the observers that the time was merely incidental and that they should not feel that they were under a time-test. In some examples we gave to each observer certain explanations which we considered necessary.

A word should be said about the *method of scoring.* The first task, decision as to validity, was scored either *right* or *wrong;* the second task, explanation of fallacies in the observer's own terms, was scored *very good, good, fair, poor* or *none;* the third task, assignment of name of fallacy, was scored *right, wrong* or *none.* Some of the arguments could properly be cast into more than one logical form: in the instances in which observers chose to arrange the argument in a form different from that we had had in mind, but which was nevertheless legitimate, the decision was given a perfect score, provided, of course, the variant interpretation was really correct.

[3]When an observer adjudged an argument valid, he was not required to state his reasons. We now believe that it would be better, if anyone were to repeat this experiment, to have the reasons given in all cases, whether the arguments be pronounced valid or not.

VI. The Results.

We present first some sample results which will serve to indicate the sort of examples employed and the way in which the detailed data were secured. We shall then summarize the data for all the examples in a single quantitative array.

Example 13.

"If a nation wants protection, it is not prosperous under free trade, so England must be prosperous, since it does not want protection."

Obs.[4]	*Decision*	*Explanation*	*Name given*	*Time taken (in sec.)*
C	Not valid	Very good	Denying antecedent	90
B	Not valid	Very good	Denying antecedent	120
G	Not valid	Very good	Denying antecedent	180
Mt	Not valid	Poor	Undistributed middle	100
Wn	Not valid	Poor	Undistributed middle	120
Ad	Not valid	Poor	Undistributed middle	180
Sc	Not valid	Good	None given	300
Hl	Not valid	Good	None given	180
Fr	Not valid	Very good	Denying antecedent	120

Example 42.

"We should not heed the clamor for the initiative and referendum, for men like President Taft, Andrew D. White and Nicholas Murray Butler are opposed to them."

Obs.	*Decision*	*Explanation*	*Name given*	*Time taken*
C	Not valid	Very good	Appeal to authority	60
B	Not valid	Very good	Appeal to authority	30
G	Not valid	Very good	Appeal to authority	60
Mt	Not valid	Good	None	60
Wn	Not valid	Good	None	120
Ad	Not valid	Good	None	90
Sc	Not valid	Good	None	90
Hl	Not valid	Poor	None	120
Fr	Not valid	Very good	None	90

[4] In these examples and in the final table, the first three observers, whose names are represented by a single letter, are those of the 'tutored' group.

Example 61.

"J. H. Gallinger, leader of the Taft forces in New Hampshire and dean of the reactionaries in the United States Senate, has written a letter to the soldiers of his State, in which he says: 'As chairman of the Senate Committee on Pensions for many years, it was my special privilege to serve them, and I did so in every way possible. I want to appeal to the soldiers to do me a favor, and that is to go to the caucuses and vote in favor of Taft delegates.' He then comes across with a more cogent argument: 'It is a well-known fact that the man who is now opposing him so bitterly and unjustly was never favorable to pension legislation, while President Taft has unhesitatingly signed every bill that has been sent to him.'"

Obs.	*Decision*	*Explanation*	*Name given*	*Time taken*
C	Not valid	Good	Irrelevant conclusion	240
B	Not valid	Very good	Irrelevant conclusion	150
G	Not valid	Very good	Irrelevant conclusion	90
Mt	Not valid	Good	Appeal to people	70
Wn	Not valid	Good	Appeal to pity	130
Ad	Not valid	Good	None	90
Sc	Not valid	Very good	None	120
Hl	Not valid	Fair	None	120
Fr	Not valid	Fair	None	120

Example 64.

"Why does the murderer deserve death? The answer will be because he has deliberately taken human life. Then, of course, the same guilt is perpetrated and the same penalty incurred when the State deliberately takes human life in return. For wherein is there a difference? Both acts of homicide are perpetrated willfully, and to our mind the homicide of the law is worse than the homicide of the assassin, inasmuch as it is committed in cool blood and in the light of day."

Obs.	*Decision*	*Explanation*	*Name given*	*Time taken*
C	Not valid	Very good	False analogy	60
B	Not valid	Very good	False analogy	150
G	Valid	———	———	120
Mt	Valid	———	———	120
Wn	Not valid	Very good	False analogy	60
Ad	Valid	———	———	90
Sc	Not valid	Good	———	180
Hl	Not valid	Good	None	120
Fr	Not valid	Good	None	120

The results for the 45 test-examples given to both groups of observers are brought together so as to show for each observer and for the two groups (1) the correctness of the decisions as to validity of the arguments, (2) the merits of the explanations proffered for the decisions of invalidity, (3) the ability to designate the name of the fallacy, and (4) the average time taken (here in minutes).

SUMMARIZED RESULTS FOR 45 TEST-EXAMPLES WITH ALL OBSERVERS.

	Decision on validity.		Explanation.					Name given.			
Obs.	Right.	Wrong.	Very good.	Good.	Fair.	Poor.	None.	Right.	Wrong.	None.	Time.
C.	41	4	26	5	4	0	0	31	0	2	2.19
B.	43	2	22	4	7	5	0	19	11	3	2.28
G.	42	3	24	2	6	4	0	18	9	6	2.16
Aver.	42	3	24	3.6	5.6	3	0	22.6	6.6	3.6	2.21
Mt.	31	13*	8	5	7	7	1	1	10	17	1.71
Wn.	36	9	9	13	6	1	1	5	6	18	1.95
Ad.	32	13	9	7	4	5	1	1	4	20	2.06
Sc.	39	6	15	10	4	5	1	4	3	25	2.06
Hl.	36	9	6	11	7	5	2	2	1	27	2.64
Fr.	38	7	12	10	5	6	0	1	1	28	1.88
Aver.	35.3	9.5	9.8	9.3	5.5	4.9	1	2.3	4.2	22.5	2.05

(1) The table shows clearly enough that the decision as to the validity of the arguments was not very difficult, nevertheless there is a clear superiority of the inductively taught group; in fact, no one of the class-taught observers does so well as the poorest of the tutored group.

(2) The quality of the reasons advanced for the decisions of invalidity is very distinctly superior in the inductively taught group, for on the average, they gave 24 'very good' explanations as against 9.8 explanations of that quality on the part of the other observers.

(3) The fact that our inductively taught group should be some ten times as able to assign correctly the proper logical names to the fallacies detected as are the class-taught observ-

*Mt was unable to come to a decision with one example.

ers is, perhaps, less surprising, partly because the latter group had never had so much training in specifically 'labelling' fallacies, partly because some of them had not been dealing with these terms for intervals of one to three years. However, the two observers, *Wn* and *Fr,* who were fresh from the course in logic were practically as poor in this respect as the rest of their group.

(4) From the record of time taken in solving the examples no conclusions can be drawn; nor, indeed, was it contemplated as a matter of particular import. The average time per example was 2.21 min. for the tutored and 2.05 min. for the class group. The fact that the latter group failed in most instances even to attempt to name the fallacy would account for any real difference in these times.

VII. Conclusions.

The general conclusion which seems to be indicated is this: *The learning of the various forms of fallacious reasoning by an essentially inductive method makes the learner more efficient in the subsequent detection of fallacious reasoning, in the assignment of reasons for such fallaciousness and in the subsumption of the fallacies under their proper logical designations than does the formal study of logic as commonly taught in university classes.* That our specially taught group did 'carry over' the patterns they had learned in such a way as to be able to apply them to new material seems clearly evident from the tabular results just reported. It might be added, in further confirmation, that these observers decided correctly in every single case of the remaining 47 test-examples which have been omitted from tabulation because time did not permit us to use them with the second group of observers. In these extra 47 examples these specially drilled observers gave 'very good' explanations in from 26 to 29 cases and designated the fallacy correctly by name in from 26 to 29 cases.

While, however, we are fairly well convinced that a painstaking drill in the analysis of concrete examples of argumenta-

tion, taken from various phases of everyday life, could advantageously be substituted for the more deductive work of the ordinary course in logic—accompanied, as it too often is, by the sheer memorizing of logical 'figures' and rules, and while we are convinced that the belief that the average student of logic will, after his course in logic, actually apply the principles he has there learned, is a misleading and erroneous belief, we must, nevertheless, admit that this present experiment does not prove these convictions incontestably. It is for this reason that we have termed this a "preliminary study."

The criticisms that can be passed upon our work are fairly obvious. In the first place, we worked with only a few observers, though the differences we found are for the most part large enough to transcend the limits of unreliability on this score. In the second place, it would have been more convincing if we could have retested our specially drilled observers several months, or better several years, after the termination of our drill. In the third place, what is a more serious objection, we unfortunately compared two groups under not entirely equivalent conditions; we contrasted not only inductive with deductive instruction, but also individual instruction with classroom instruction. We are unable to say how great an error has been introduced by this disparity in the conditions. So far as actual number of hours is concerned, disparity, as has been explained, does not exist. Yet readers who are inclined to attach a large amount of importance to individual as against class instruction may feel that this is the most essential point of difference between our two groups.

In conclusion, then, we hope that this experiment may be repeated under more precise control and with the modifications that we have suggested in several places in our discussion. We would also recommend the introduction in the final testing of a third comparison group—one whose members had had no instruction whatsoever in the forms of argumentation. By employing some observers skilled in introspection it might also be possible to attack that phase of our study which we were unable to reach, viz., the question of the formation and

transfer of patterns of logical reasoning. Aside from the objective results already presented, our only light on this problem came from the statement of one of our tutored observers, who reported in several instances that he made a deliberate comparison of the test-example with the typical example that had been used in his training.

PSYCHOLOGICAL METHODS AS APPLIED TO ADVERTISING.

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The application of psychological laboratory methods to advertising problems has a twofold purport. It is of value to advertising and to psychology. For if the relative value of each advertisement in a set may be determined accurately before it has been used, then much waste may be eliminated by simply not using the poorer advertisements of the set. At the present time there is no way of estimating which are the good and which are the poor advertisements except on the basis of personal judgment; and when the reviews and criticisms of different advertising men are compared, it is apparent that this personal judgment is today a very variable factor. But this phase of the question is less interesting to the readers of this JOURNAL than the other one, *i. e.*, the value of such work to psychology itself.

The greater part of the experimental work that has been done in psychology has been under the influence of the more or less conscious ideal that we must understand the *simple* mental processes first, and then build up to the complex from this basis by combining known simple processes. With no thought of criticizing this ideal, it is well, however, to face the situation that it is going to be a very long time before, by such a procedure, an analysis can be made as to why A buys Crisco in response to the advertisements which have appeared during the last year. In the field of aesthetics we have a similar situation. The "simple" forms, such as squares, rectangles, circles, ellipses, etc., were studied. And then the experimenting practically stopped, for the problem of building from these up to a work of art was too vast to be dealt with. (Of course, general principles have been developed in the study of the

simple which have been carried over and applied to the complex, but, strictly speaking, there has been no extended attempt to build up from the simple to the complex.)

Moreover, we must ask whether a square and an ellipse really are *simpler* psychologically than a simple (that is, uncomplicated) photo or drawing. An immediate response can be made to either ellipse or photo as to whether they are pleasing or not. Both can be "grasped" in one glance and can be reproduced or identified later. It is true that more details will be lacking in the reproduction of the simple photo than of the ellipse, but, on the other hand, it can be more definitely identified later on than can the ellipse. Simpson[1] reports that but 42 per cent. of 25 simple forms could be identified by his group of 17 "good" subjects and 18 per cent. by his "poor" subjects, while 73 per cent. of 25 advertisements can be identified by college students, who were of less ability than his "good" group..[2] Is there any reason, then, why complex physical material may not be used as well as simple physical material as the stimulus for experimental work? Are we justified in declaring the latter produces simple psychical reactions, whereas the former does not, or even that the latter produces simpler reactions than the former? And in any case, is it not worth while to know what the human mind will do in its response to a complex physical stimulus?

With these thoughts in mind the following experiment, made with complex physical material, is presented as showing that such material is consistently reacted to, and that experimental methods can now foretell which advertisement will influence the most individuals.

From a psychological standpoint there are two main problems to be considered in evaluating any advertisement. The advertisement must, first of all, attract attention. Unless it is noticed by the reader it has no value at all. It must, secondly, create a desire for the advertised commodity. Some advertisements have good "attention-value," in that they attract attention to themselves, but they do not influence the

[1]B. R. Simpson. *Correlations of Mental Abilities.* Teachers College. Cont. to Education, No. 53, 1912, p. 37.

[2]E. K. Strong, Jr. *The Effect of Length of Series Upon Recognition Memory.* Psych. Rev., XIX, No. 6, Nov., 1912, p. 459.

reader toward buying—they lack "pulling-power." In making any study of advertisements both of these factors must be considered.

Our experience, based on experiment and introspection, has shown that the two factors—attracting attention and creating desire—must be considered separately. By this it is not meant that the two factors are separate and distinct, and that they each depend on different features of the advertisement—an error into which the bulk of advertising writers have fallen—but that they depend on two different attitudes of the reader. When studying the first factor we must have our subject in a passive attitude toward the material before him and then determine what advertisements catch his attention, *i. e.*, arouse him so that he stops and looks at them, in contradistinction to the remaining advertisements. Psychologically stated, we have involved here the factors of perception and passive or primary attention. But when studying the second factor—that of creating desire—we have to have our subject in an active attitude. At least, we do have him in such a condition as soon as the experiment is started. And because that is so, we cannot then determine which advertisements would have attracted him while in a passive "don't-care" attitude. It is because of this situation that the two separate tests—one for "attention-value" and the other for "pulling-power"—have been developed.

A concrete example will make this matter clearer. Mr. F. R. Davis of the General Electric Co. supplied the writer sometime ago with five tungsten lamp advertisements, together with the detailed results that the company obtained from them. Only three of the five will be considered here, as the other two were quite different in one respect from these three. This difference so noticeably affected the company's data that no real comparison can be made between the actual returns of the two advertisements and those of the three. For the sake of simplicity, therefore, the two will not be used here.

The relative attention-value of the three advertisements can be expressed by the following figures:

Advertisement A,	attention-value	1.88	P. E. 0.17
" B,	"	1.80	P. E. 0.16
" C,	"	2.25	P. E. 0.14

The figures represent the relative order of effectiveness in attracting attention. If A had been first in every case, it would have been ranked "1.00"; if B had been second in every case, it would have been ranked "2.00," and if C had been third in every case, it would have been ranked "3.00." But the three advertisements did not have these three positions in every case. A and B are practically tied at 1.8, and C stands at 2.3. The probable errors (P. E.) indicate that there is no true difference between A and B, but that both are decidedly superior to C.

The method used in obtaining these results was as follows: The advertisements were laid face up on a table in such a way

ADVERTISEMENT A.

ADVERTISEMENT B.

that they were hidden from the subject by a screen. It was explained to the subject that there were three advertisements on the table, and that in a moment the screen would be removed; that he was to take one general glance at all the advertisements and then to commence picking them up as fast as he could in the order in which they caught his attention. Two points were emphasized—first, that he was simply to glance at all the advertisements for only a moment; second, that he was then immediately to commence picking them up, and must continue doing so until they were all picked up. The order in which they were picked up was recorded. This order represented the relative order of "attention-value" of these advertisements for that individual. This order differs for different individuals; some orders so obtained are found to be nearly the reverse of other orders.

"Attention-value" depends on the relationship of the de-

tails in an advertisement to the past experience of the reader. The firm name may have no attention-value for 99 per cent. of readers, but have tremendous attention-value for 1 per cent. simply because it is their family name. And so with other details. Ordinarily speaking, an advertisement commands our attention because it has in it some detail or details that are familiar and interesting; in very exceptional cases, because it concerns a strikingly unknown object. No distinction is made in this test between attention-value depending upon relevant or irrelevant details in the advertisement. The former is, of course, superior, but I believe the difference between the two is measured in the experiment on pulling-power, described below, and so need not concern us here.

Two precautions are always taken in this test. The advertisements are rotated in position on the table as they are suc-

ADVERTISEMENT C.

cessively exposed, in order to equalize any difference due to position. Second, the advertisements are not shown to the subject before the experiment—they are relatively unfamiliar to him at the time of the test.[3]

From the order in which the advertisements were picked up by the various subjects an average or median may be readily obtained. This central tendency represents the final finding of the test. Medians seem much preferable to averages in this work, and are used here. They are expressed in the figures above.

Having obtained the relative "attention-value," the next step was to determine the relative convincingness or "pulling-power" of the advertisements. The directions, as employed in the test with the General Electric Co. advertisements, were as follows:

"Arrange these advertisements in the order in which *you would buy* the Tungsten lamps.

"Take for granted that each advertisement represents a different make of lamp, that is, one is a Western Electric, one a General Electric, etc."

The second paragraph heads off a great many questions, and was used simply and solely for that purpose. In other words, it makes the work more natural and real. When the arrangement was completed, the second part of the directions was presented to the subject. It was as follows:

"When you have completed your arrangement, give each advertisement a grade on a scale from 100 to 0. 100 should represent that grade you would give an advertisement which appeals so strongly as to irresistibly force you to buy the article. 0 should represent that grade you would give an advertisement that had no appeal for you at all, i. e., had no effect on you."

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[3] H. L. Hollingworth first applied this procedure in this connection. It is recorded in the writer's monograph, *The Relative Merit of Advertisements*, Archives of Psychol., No. 17, 1911, p. 11, and more fully considered in an article in Advertising and Selling, Dec., 1911. R. M. Yerkes has also used the same procedure. See *The Class Experiment in Psychology with Advertisements as Materials*, J. Ed. Psychol., III. No. 1, Jan., 1912. The writer now prefers a recognition memory test instead of this one. But a comparison of the two methods has not as yet been made, nor can we be sure that either is adequate. For a partial description of the latter method, although presented for another purpose, see the writer's recent article on recognition memory, *op. cit.*

This grading of the advertisements was first adopted in order to gain some idea of whether the advertisements did or did not appeal to the subject, and also the *amount* of difference in the appeals of each separate advertisement. The writer has found that the data from these grades can be used as instructively as the data from the arrangements. Advertisements that are distasteful or antagonistic, or that prejudice

TABLE I. *Showing "Pulling-Power" of the Three General Electric Company's Advertisements.*

Subjects.	Data Based on Order of Merit. Advertisements.			Data Based on Grades Assigned Each Advertisement. Advertisements.		
	A	B	C	A	B	C
1.	3	1	2	50	100	85
2.	3	1	2	40	85	80
3.	1	2	3	100	50	25
4.	1	3	2	50	15	40
5.	3	2	1	45	85	90
6.	1	3	2	75	25	50
7.	1	3	2	50	25	45
8.	1½	3	1½	50	30	50
9.	1½	3	1½	85	70	85
10.	3	2	1	45	50	75
11.	2	3	1	60	0	70
12.	2	3	1	85	60	87
13.	1	3	2	83	78	80
14.	2	3	1	65	15	75
15.	2	3	1	80	35	90
16.	3	2	1	50	70	75
17.	2	1	3	80	100	60
18.	1	3	2	70	50	60
19.	2	3	1	75	70	90
20.	2	3	1	40	0	80
21.	2	3	1	80	38	100
22.	3	1	2	50	100	75
23.	3	1	2	50	90	80
24.	1	3	2	90	50	60
25.	1	3	2	80	10	40
26.	2	3	1	65	0	80
27.	1	3	2	70	25	60
28.	1	2	3	90	70	0
29.	3	2	1	50	80	95
30.	2½	1	2½	25	30	25
31.	1	3	2	85	60	75
32.	1	2	3	100	40	20
33.	1	2	3	90	75	0
34.	2	1	3	25	85	15
35.	1	3	2	70	10	40
36.	2	3	1	85	75	95
Median	1.74	2.64	1.76	69.2	52.5	73.5
P. E.	.10	.09	.09	2.8	4.4	3.3

one against the advertised article, are, of course, to be graded below 0. Very few such cases occur with men, but they are quite frequent with women.

In a good many cases the subject will revise his order of arrangement when forced to grade the advertisements. The revised order is preferable, because the act of grading the advertisements seemingly forces greater concentration upon the work, and the subject tends to forget that it is only an experiment and to act more as he would if actually confronted with the situation.[4]

Table I presents the results from 36 subjects respecting the relative "pulling-power" or persuasiveness of the three General Electric advertisements. The individual results are given, as they afford an opportunity to compare the data from the two separate methods of measuring "pulling-power." The first three columns of the table give the respective orders of arrangement of the 36 subjects, and the last three columns give the respective ratings of the same subjects. Subjects 1 to 24 are men, and 25 to 36 are women. The medians of the six columns are given together, with their probable errors. From the medians of the first three columns we must conclude that advertisements A and C are about equal in value, with the advantage in favor of A, and that B is very much inferior to the other two. From the medians of the last three columns we likewise must conclude that A and C are about equal in value, but that here the advantage is reversed, being somewhat in favor of C. B is here again decidedly inferior to the other two. (The two systems of recording results are sometimes puzzling to the uninitiated. But if it is borne in mind that in the first three columns—where an order of merit is obtained—the smaller the figure the better is the advertisement, because it is ranked more nearly first, *i. e.*, "1.00," and that in the last three columns—where a percentage of perfection is recorded—the larger the figure, the better is the advertisement, because it is ranked then more nearly 100 per cent., the meaning of the figures will be clear.) We should conclude from the two sets

[4]For a more detailed description of this test for pulling-power, see *Application of the "Order of Merit" Method to Advertising*, J. Philos., Psychol., and Sci. Methods, VIII, 22, Oct. 26, 1911, and the writer's monograph, *op. cit.*

of data that advertisements A and C are practically equal in "pulling-power," while B is decidedly inferior.

We now have the following results:

Advertisements A and B are equal in "attention-value"; C is inferior.

Advertisements A and C are equal in "pulling-power"; B is inferior.

We must undoubtedly conclude, then, that A is the most efficient of the three. How to equate the other two properly is still unknown. The relationship of the "attention-value" test to the "pulling-power" test can only be solved after much more work has been done. At present the indications from a number of tests lead the writer to place very much more emphasis upon the "pulling-power" than upon the "attention-value" test. He would then conclude in this particular case that C is only a little less efficient than A, while B is considerably inferior. In other words, he follows the "pulling-power" test and modifies its results only slightly in accordance with the results of the "attention-value" test. (The "pulling-power" test will ordinarily correlate very highly with the actual results, while the "attention-value" test does not necessarily show high correlation.)

The *actual results* from these three advertisements as supplied by Mr. F. R. Davis of the General Electric Co. show that advertisements A and C were about equal in value, although A was the superior of the two, and that both advertisements were very much superior to B. Efficiency ratios of the three advertisements in terms of A were as follows: 100 for A, 52 for B and 93 for C.

These experiments show, then, an order of efficiency of the three advertisements and give some idea as to the amount of difference in efficiency between the various advertisements. This order of efficiency agrees with the order obtained in actual business. All the experiments so far conducted have resulted in quite close agreement between the experimental results and the business returns.

What we need now is methods which will give not simply an *order of merit,* but some fairly definite idea as to the *amount* of business each advertisement will bring in in terms

of any one of them. The methods of grading advertisements after they have been arranged in an order of merit (see the second three columns of Table I) appears to be a step in this desired direction. If the medians—69.2 for A, 52.5 for B and 73.5 for C—are divided by 69.2 to reduce them all to ratios in terms of A, we have the following ratios: 100 for A, 76 for B and 106 for C.[5]

These ratios do not agree very closely with those supplied by the General Electric Co. But the experimental ratios are only based on the "pulling-power" factor, and do not take into account the "attention-value" factor. The poor "attention-value" of C would bring down the ratio as given above, making the experimental ratio more nearly in accord with the actual ratio; but, on the other hand, the good "attention-value" of B would raise the experimental ratio, making it still higher than the actual value would lead us to expect.

What we have obtained in this experiment is this: We have determined experimentally that advertisements A and C are about equal in efficiency, with the advantage in favor of A, and we have determined that B is very much inferior. Our knowledge of the results obtained from these advertisements in actual business shows that our analysis is correct. Our attempt, however, to state the experimental findings in efficiency ratios has not been so accurate as we should like. Further work must be done before we can be confident of such results. Nevertheless, the grades do point out clearly that A and C are about equal, and that B is very much less efficient, which is the actual situation.

No attempt was made in this particular experiment to determine *why* A and C were about equal in creating desire for the lamps and why B was inferior to them in this respect. The *why* is a different problem from the *what*, and seemingly much more difficult to handle.[6]

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[5] If the averages had been used instead of the medians, the experimental ratios would have been 100 for A, 78 for B and 95 for C. These ratios agree very much better with the actual ratios than do those obtained from the medians. But in the majority of cases the median has given more valid results than has the average.

[6] See R. M. Yerkes' article, *op. cit.*, for one attempt to analyze the cause of an advertisement's effectiveness.

Introspection has often given very valuable hints as to the *why,* and the writer employs it ordinarily in all his work. But at best, he has never felt that it gave more than simple suggestions as to the real cause of the subject's attitude toward the advertisement. In the vast majority of cases nothing of value has been obtained and no true introspections appeared. Well-trained psychologists, who emphasize introspection in their writings, when acting as subjects for the writer have failed in this case to give introspections which they considered of any value at all.

A good many psychologists hold that the work represented in this article is not psychological, in that it does not analyze the mental processes involved. The writer feels that, if this is the case, Ebbinghaus' study of the fading of memory also cannot be deemed psychological, as it gives only the results of mental processes, but does not explain them. But surely the facts concerning memory given us by Ebbinghaus in his curve have been of tremendous value in later analyses of the process itself. Is not the situation the same here? When once we *know* that A is superior to B, then we can intelligently attempt to explain the cause; but before we know this result of mental work we cannot attempt an explanation of causes of any sort. It is with this idea in mind that the writer holds to the belief that what has been presented is within the psychological realm. But it is only one step toward a complete understanding of the whole situation, and many more steps are necessary before the end can be reached.

CORRELATION OF ABILITIES AS AFFECTED BY PRACTICE.

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Attempts to intercorrelate mental or motor abilities as measured by laboratory tests have usually produced more or less irregular results. Some of the coefficients have been positive, some negative, but in few cases have many of them been large when the individuals tested have been chosen at random or with no deliberate intention of measuring only the extremes of the curve of distribution. Thus Pyle, in a recent report of correlations of abilities among several hundred adult individuals, remarks that a certain test for logical memory is "one of the very best tests" partly because of "its high correlation with other tests", an average correlation of .29.[1]

Two reasons are largely responsible for these low coefficients. The first is the fact that the measures correlated have usually been initial trials or at most averages of a very few trials. This means great individual variability, and considerable consequent attenuation which must in some way be corrected for. A more important factor, perhaps, is the fact that these preliminary trials do not necessarily represent the final capacities of the individuals. They are determined by a host of incidental or accidental influences and reveal only momentary ability, not ultimate capacity. Thorndike has shown[2] that there is every reason for finding "desirable traits" to be positively correlated, and we may well expect to find this in-

[1]Jour. Ed. Psych., Feb., 1913, p. 63.

[2]Educational Psychology, p. 184.

creasingly true the more our measures test the final limits of capacity in the various tests. In other words, the only real correction for attenuation is by continuing the test until the individual has reached the limit of practice in the test.

Only occasional attempts have been made to determine the influence of practice on the correlation of abilities, and those that have been reported have been based on so few practice trials that no review of them need be given at this point. The present study presents the results of an experiment in which a group of observers were repeatedly tested until in each test a practice limit was reached, a limit which 100 further trials failed to improve. Such questions as the following are at once suggested.

1—What is the effect of practice on the correlation of specific abilities?

2—What factors are responsible for this effect?

3—What is the significance of the finding?

In the experiments here reported, six familiar laboratory tests have been repeated 205 times by each of 13 observers. The tests were *Adding, Color Naming, Opposites, Discrimination Reaction to Colors, Coordination* (three hole test) and *Tapping*.[3] On 32 days 5 trials were made daily, at intervals of about two hours. On each of the remaining 3 days 15 trials were made, at intervals of about 45 minutes.

Each test has been correlated with all of the remaining tests, at various points in the curve of practice. These points, and the measures representing them, are as follows:

1—Preliminary trial	designated as	1st trial
2—Median of first 5 trials	" "	5th trial
3—Median of trials 20 to 25	" "	25th trial
4—Median of trials 75 to 80	" "	80th trial
5—Median of trials 200 to 205	" "	205th trial

[3]A full account of the character and technique of these tests is to be found in the writer's "The Influence of Caffein on Efficiency."

TABLE I.

Showing the Correlation of each Test with every other, at various points in the Curve of Practice.

	Trial.	Tapping.	Co-ordination.	Discrimination.	Color Naming.	Opposites.	Adding.	Average.
	1	.45	—.21	.23	.26	.23		.19
	5	.55	.32	.44	—.03	.17		.41
Adding	25	.49	.22	.33	.91	.57		.50
	80	.55	.19	.52	.85	.63		.55
	205	.57	.16	.15	.76	.76		.48
	1	.36	—.14	—.46	.53		.23	.10
	5	.26	—.17	.39	.66		.17	.26
Opposites	25	.49	—.14	.27	.54		.57	.35
	80	.33	.27	.26	.68		.63	.43
	205	.55	.50	.39	.88		.76	.62
	1	.36	—.28	—.13		.53	.26	.15
Color-	5	—.03	—.19	.36		.66	—.03	.15
Naming	25	.29	—.03	.43		.54	.91	.43
	80	.28	.28	.54		.68	.85	.53
	205	.52	.47	.41		.88	.76	.61
	1	—.08	.11		—.13	—.46	.23	—.07
Discrim-	5	.33	.23		.36	.39	.44	.35
ination	25	.35	—.05		.43	.27	.33	.27
	80	.30	—.08		.54	.26	.52	.31
	205	.59	.19		.41	.39	.15	.35
	1	—.25		.11	—.28	—.14	—.21	—.15
Coordin-	5	.50		.23	—.19	—.17	.32	.21
ation	25	.13		—.05	—.03	—.14	.22	.03
	80	.26		—.08	.28	.27	.19	.18
	205	.39		.19	.47	.50	.16	.34
	1		—.25	—.08	.36	.36	.45	.17
	5		.50	.33	—.03	.26	.55	.32
Tapping	25		.13	.25	.29	.49	.49	.35
	80		.26	.30	.28	.33	.55	.34
	205		.39	.59	.52	.55	.57	.52

TABLE II.

Showing the Average Correlation of each Test with all others; at various points in the Curve of Practice.

Trial.	Adding.	Opposites.	Color Naming.	Discrimination.	Co-ordination.	Tapping.	Final Averages.
1	.19	.10	.15	—.07	—.15	.17	.065
5	.41	.26	.15	.35	.21	.32	.280
25	.50	.35	.43	.27	.03	.35	.320
80	.55	.43	.53	.31	.18	.34	.390
205	.48	.62	.61	.35	.34	.52	.490

At each of these points the 13 individuals were arranged in an order of relative ability for each of the 6 tests, and these orders correlated by the formula $r = 1 - \frac{6\Sigma d^2}{n(n^2-1)}$. Table I gives the correlations in detail, of each test with every other, for the five points on the curve of practice. Table II gives, for each test, at each point, the average correlation with all the other tests, and also the grand average correlations of all tests.

Except in the case of *Discrimination Time* the effect of practice is to increase, to a marked degree, the intercorrelations of the various tests. Considering the averages in Table II, *Adding* increases steadily up to the 80th trial. *Opposites* and *Color Naming* gain even more steadily to the very end of the experiment, the increase in the coefficients being four to six fold. *Tapping* increases more slowly but no less certainly. In *Coordination* the increase is very irregular, but the coefficients show, on the whole, a change from —.15 at 1st trial to .34 at the finish. Only in the case of *Discrimination Time* is there failure to increase after the 5th trial. The coefficients here remain fairly constant, dropping slightly in the early middle of the experiment.

But in no case, after the preliminary trial, is there a negative coefficient among the average correlations, and indeed, in only one case is there a coefficient smaller than .15. The final grand averages show steady increase from .065 in the preliminary to .28 at the 5th, .32 at the 25th, .39 at the 80th

and .49 at the 205th trials. *With practice, then, the average correlations of all tests become positive, and the coefficients become greater the longer the practice is continued.*

If reference be now made to Table I the details of this increase may be made out. The increase is not present with every combination of tests. The following points are to be noted.

Adding,—The coefficients with *Tapping*, *Color Naming* and *Opposites* increase, those with *Coordination* decrease, and those with *Discrimination* vary irregularly.

Color Naming,—There is clear increase of all coefficients, but the maximum is reached quite early except with *Tapping* and *Coordination*.

Discrimination,—fails to show increasing correlation as the result of practice beyond the first trial. Except for a very high coefficient with *Tapping* in the 205th trial there would indeed be a general tendency toward loss rather than toward gain.

Coordination,—shows much the same tendency as *Discrimination*. Beyond the 5th trial there is on the average a loss, which is recovered only by the last trial, as a result of high correlation with *Color Naming* and *Opposites*. In the other cases the coefficients decrease.

Tapping,—beyond the 5th trial makes clear gains only with *Opposites* and *Color Naming*. The remaining coefficients either remain fairly constant (*Adding*) or decline (*Coordination*) or make clear gains only by the end of the experiment (*Discrimination*).

In producing this general increase in the correlation of specific abilities through the medium of practice, at least three different factors probably cooperate.

A—*Variability of Performance.* In the beginning of the experiment each individual is more variable than at later points in the curve. This momentary variability need not be supposed to affect all the tests in the same way nor all individuals in the same direction. This fact will then tend to reduce the correlation of the preliminary trials to a considerable degree and will in some cases materially affect the first five to ten trials. Beyond the 25th trial the variability in these tests is much reduced, and particularly so in the measures here used. which are in all cases, after the preliminary trial, the medians of five successive records.

B—*Changes in the Character of the Tests Themselves.* It is quite probable that, with many observers, the *Opposites* test, for example, comes, after many repetitions, to resemble more and more that type of process or function involved in *Color Naming*. The responses become more and more inti-

mately associated with the stimulus words, the suggested responses to each word become more and more limited in number and in most cases reduced to a single word for each stimulus. This is true, in *Color Naming*, at the very beginning. As the order of the stimulus words is changed at each trial, the test may come more and more to involve merely the quickest possible association of the right response, and the overcoming of inhibitions and interferences of a more or less general sort, and less and less of the element of selection. Much the same thing may also be true of the *Adding* test. It is in these three tests that the increase in correlation is most marked, and the actual coefficients highest at the end of the experiment. Careful analysis of what takes place as one improves in these simple tests would no doubt yield interesting material.

But these two factors, decrease in variability and change in the character of the tests, seem to the writer to be far from sufficient to account for the results. The *Tapping* test remains very much the same type of process throughout, the only apparent modifications being in slight changes in method and perhaps some gradual change in the muscles. There is certainly no reason to suspect that *Tapping* and *Opposites* or *Tapping* and *Discrimination* become, as tests, more alike because of frequent repetition. But the increase in correlation is clear in both these cases. Again, it is well established that the discrimination reaction, in the form here used, also tends to become reflex through practice, the conscious discrimination coming only after the correct reaction has been made. These experiments called for between 3075 and 4100 single discrimination reactions on the part of each observer, which would afford ample time for such a change to show itself. Mere change in the character of the test would then lead us to expect *Color Naming, Opposites,* and *Adding* to come more and more to resemble *Discrimination* Reaction. But they do not, if the coefficients may be taken as evidence. The coefficients of these tests with *Discrimination* show no tendency to increase, even by the end of the experiment. Further, there is clear increase in correlation between *Coordination* and *Color Naming,* and between *Coordination* and *Opposites.* The assumption of increasing similarity in the character of these pairs of tests

would seem rather gratuitous. Moreover, if there were such an increase in similarity, and this be also supposed to account for the higher correlation of *Color Naming* and *Opposites* with *Adding*, *Coordination* and *Adding* should show the same increase in correlation. Just the reverse is actually the case, the correlation of *Coordination* with *Adding* decreasing consistently.

C—"*General Ability.*" Some further factor must then be responsible for the general increase in correlation, aside from decrease in variability (which affects only the first few trials) and progressive qualitative approximation of the tests (which is seen to be inadequate). The so called "general ability" of Spearman and others at once suggests itself in this connection. If there is such a thing as "general ability" or "general intelligence" we should expect all samplings of that ability to correlate more and more the more the measures came to be "true samplings." We might indeed expect to find evidences of this general ability only when measuring the "ultimate capacity" of the individuals concerned. The momentary ability revealed in initial trials, or even in the first half dozen trials in a given set of tests might well be expected to show only low degrees of correlation. These would not be measures of ultimate capacity, but would be highly determined by previous practice, chance variability, momentary attitude and initial method of attack. They would, in short, be samplings only of momentary ability, not of final capacity.

Or if the "common factor" of Spearman be rejected, the present evidence tends strongly to support Thorndike's conclusion concerning the "positive correlation between desirable mental functions." Some form of the doctrine of "general ability" at any rate, seems to be made out. But the conclusion seems to call for the qualification that "general ability" have reference to final capacity rather than to momentary performance, if the correlation is to be high. Give each individual the opportunity to attain his limit of efficiency, his highest level

of performance, and when these final limits are reached individuals who excel their fellows in one type of work will also excel in other types of work.

The theory and practice of tests has in the past been too content to rest its claims on the meagre results of a few preliminary samplings of an individual's ability. The fact that even when a great variety of such samplings of a given individual are aggregated and balanced off against each other few results of real diagnostic value are achieved should be sufficient warning against this tendency. We have above all failed to make sufficient allowance for the overwhelming importance of incentive, motive, attitude and purpose and the large role they play in determining the possible achievements of a nervous system. It is well enough to test the memory span and attention type of an applicant for a job as motor-man on a street car. It is still more important to learn the strength of his instinctive competitive reactions, to measure the intensity of his belief in hell or in socialism, or of his intention to effect the higher education of his children. And by "more important" I mean better calculated to reveal his fitness for the work. I would rather trust my life and limb to a motor-man whose feeble memory span is reinforced by an intense devotion to the comfort of his grandmother than to a mnemonic prodigy whose chief actuating motive in life is to be "a good fellow."

I do not wish to underestimate the usefulness of the simple preliminary test as a means of detecting extreme departures from the mode,—such departures as idiocy, retardation, etc. The use of preliminary tests in such cases has been amply justified by experience with them. I am primarily interested, at this point, in the determination of individual differences within the large middle range of the curve of distribution. My conviction is that for this purpose we shall find it necessary to determine the individual's "limit of practice" in the various tests before we shall secure diagnostic results which

will be verified by the individual's subsequent achievement in daily life.*

Professor Thorndike has recently taken occasion to prophesy the important results in the way of educational diagnosis which will come when we know still more about mental tests than we now do. His conservative and well supported prophesy is given by way of a safe argument "that the results of the study of mental tests are beginning to be important for education and the other arts of social control of human nature." It is significant that most of the tests included in his suggested list are such as, in the experience of the writer at least, show fairly high correlation between the records of the first half dozen trials and final capacity after practice. We should know much more than we do about the tendency

*Just as this paper was going to press Professor Whipple called my attention to a conclusion stated by Cyril Burt in his paper, "Experimental Tests of General Intelligence" (*Brit. Jour. of Psychol.*, 1909, pp. 94-177). Burt states that with one or two exceptions the correlations of test records with general estimates of intelligence "is highest on the first occasion, that is, when the task is newest." Spearman, in a letter to Burt, writes: "I have found over and over again that practise may greatly increase tendencies to correlate." Burt, however, takes Spearman to mean "practise during the same sitting," and concludes, on the basis of his own data, that "practise in successive sittings seems to have the reverse effect on intelligence correlations in tests where procedure is readily grasped" (p. 123).

This conclusion of Burt's, if stated as a generalization, does not seem to me to be warranted by his data. Two or three trials can hardly be dignified by the name "practise," at least in the sense in which that word is used in the present connection (approximation to limit of ability). In the one test in which more than three trials were made (Spot Pattern, 6 trials) Burt finds progressive increase in correlation, the successive coefficients being 19, 57, 58, 69, 64, 41. Indeed, in one-fourth of the total number of cases, taking only the first two trials, the second coefficient is higher than the first; further, comparing the second and third trials, in the 9 cases in which three trials are available, the third is higher than the second in two-thirds of the cases.

If Burt's conclusion, in its generalized form, were correct, one would be curious to know why practise, while increasing the intercorrelation of tests, should decrease their correlation with general estimates of intelligence. But the generalization can probably not be made. Burt himself, in an earlier paragraph, remarks: "The result of special practise in the experimental tests * * * would only be to convert a measurement of a special mental process at its first appearance into a measurement of that process at its maximum efficiency, and as this must form a far truer measurement of that process itself, it presumably would also form a superior test of the intelligence correlated with it" (p. 103).

A useful extension of Burt's interesting experiments might well be made by correlating practise limits with general impressions of intelligence. In a forthcoming paper I shall show that preliminary trials in tests do not reveal the final relative abilities of the individuals as determined by their practise limits in the same tests.

and meaning of such correlations, particularly if we wish to extend the method of tests beyond educational diagnosis and use them as means of vocational guidance or of industrial selection. For educational diagnosis we wish primarily to learn what kind of practice the individual needs most. For vocational and industrial purposes we need rather to know what limits the individual can reach, in given kinds of performance, as the result of practice, and to what degree his present equipment of incentive renders probable the actual achievement of this limit.

It is quite probable that further advance in this direction will come, not from the elaboration or invention of more tests, but by the selection of a very few tests, and the examination of the final limits of practice with respect to them. The practical problem will then be,—

1—The selection of sets of tests in which initial performance shows high correlation with ultimate capacity in the tests themselves, or else the laborious and undramatic but perhaps preferable alternative of continuing every test until practice limit is reached by the individual. In the latter case it would be well to know more about the nature and range of these limits than we now know.

2—Correlation of these tests with the particular aptnesses or fitnesses toward the detection of which diagnosis may be directed.

This is a hard and arduous program. It calls for strenuous work on the part of the investigator, patience and faithfulness on the part of observers, and wide cooperation of investigators with each other. From the immediately practical point of view it also offers an inviting opportunity to those foundations and individuals who are interested in supporting the further development of "the arts of social control over human nature."

CORRELATIONS AMONG ABILITIES IN SCHOOL STUDIES.

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The present status of the problem of correlation among mental functions may be summarized by saying that mental traits seem to be highly specialized; that they vary apparently quite independently of one another, or, in short, that correlations are surprisingly low, even among traits which on superficial observation would seem to be highly correlated.

A very serious criticism of the work in this field is that coefficients of correlation have been based on extremely inaccurate measurements. A considerable share of the data employed consist of tests made upon large groups of persons simultaneously and perhaps only once. Lack of conscientiousness, distracting influences, unfavorable mental and physical conditions of the subjects, misunderstanding of directions, and the like, have vitiated to a considerable extent the results of such group tests. Furthermore, almost any mental test, even if made carefully and under scientific conditions, but if made only once, is still a rather crude measurement of a given person's real ability in that respect. For example, if you test the memory span for words of a given person on successive days you may obtain a series of measurements about as follows: 6, 5, 6, 7, 5, etc. It is obvious that the average of these measurements represents much more correctly the real memory span of that person than any individual measurement does.

Now, it has been shown by Spearman,[1] in 1904, that inaccu-

[1] C. Spearman. *General Intelligence Objectively Determined and Measured.* Amer. Journal of Psych., 15, 1904, 201-292.

rate measurements tend to reduce the coefficient from its true value toward zero. It is obvious that the coefficients calculated from meager and incomplete measurements must be of doubtful value. The field of correlations will have to be worked over again, and computations will have to be made on more complete and more adequate tests. Some coefficients will be very much higher than they are assumed to be at present, while others may not be very different.

Besides tests on special abilities, the chief source of data has been the marks in school studies. Special interest has centered upon these because of the practical importance of determining the correlation among abilities in school studies. Numerous coefficients have been computed on the basis of marks, but in many instances it is not clear how extensive the marks were, or whether they had been assigned by one or by several teachers.

There are two reasons why coefficients based on marks have been particularly untrustworthy. One is that marks, as shown by recent investigations,[2] are exceedingly unreliable measures. For example, it has been found that marks of the same paper, assigned by teachers of the subject in the same institution, have an average variation of about 5 points on a scale of 0 to 100. The other reason is that a given pupil may have a high mark in one study and a low one in another, not because of so much divergence of ability, but because of difference in interest and effort on the part of the pupil. At another time the same pupil may do as well in the one study as in the other, because of equal interest and effort as well as equal ability.

In order to minimize the effect of inaccuracy in marks, difference in interest and effort, difference among teachers, and the like, I obtained the marks of the same pupils in the fifth, sixth, seventh and eighth grades in two schools in Madison. There were 24 pupils in these two schools who had a continuous record for these four years. From these marks an average for each pupil in each study was computed. A similar calculation was made for 40 pupils who had a continuous record

[2] D. Starch and E. C. Elliott. *Reliability of Grading High School Work in English.* School Review, 20, 1912, 442-457.

for the sixth, seventh and eighth grades in the same two schools.

These averages were then used for calculating, by Pearson's rank method, the coefficients of correlation given in Table II. The coefficients in the first column are based on the records of the 40 pupils, and those in the second column are based on the records of the 24 pupils. The latter are the more reliable coefficients. The averages for history are based on the marks in the seventh and eighth grades, since history is taught only in these two grades. Likewise, the averages for geography are based on the marks in the sixth and seventh grades in case of the 40 pupils, and on the marks in the fifth, sixth and seventh grades in case of the 24 pupils, because geography is not taught in the eighth grade. Four coefficients are based on the records of 22 pupils only, geography and history, history and reading, history and spelling, and reading and spelling (first column).

To show how much variation there is in marks obtained from year to year by the same pupils in the same studies, notice the figures in Table I. This table gives the marks of five pupils in arithmetic in the upper four grades.

TABLE I.

Grades.	A	B	C	D	E
5	87	79	70	78	80
6	84	70	76	82	74
7	87	86	84	81	76
8	94	88	79	82	74

TABLE II.

Arithmetic and language	.73	.85
Arithmetic and geography	.74	.83
Arithmetic and history	.73	...
Arithmetic and reading	.45	.67
Arithmetic and spelling	.42	.55
Language and geography	.86	.85
Language and history	.77	...
Language and reading	.80	.83
Language and spelling	.77	.71
Geography and history	.81	...
Geography and reading	.83	.80
Geography and spelling	.68	.52
History and reading	.67	...
History and spelling	.37	...
Reading and spelling	.72	.58

The most striking fact brought out by these figures is that the coefficients are very much higher than they have generally been assumed to be. Thorndike quotes,[3] for grammar-school subjects, a coefficient of .39 for English and mathematics, .36 for geography and mathematics and .43 for English and geography, as compared with .85, .83 and .85, respectively, for the same subjects in Table II, second column. The coefficients for subjects taught in high schools and colleges as given by Thorndike are approximately .40 to .50.

Second, the high coefficients in Table II are due to the much greater accuracy of the data upon which they were computed. If we calculate coefficients from marks for any single year, we obtain coefficients which are no higher than those usually quoted. I have done this in several instances and obtained a coefficient of .41 between arithmetic and language, .40 between arithmetic and history and .53 between language and history.

The third point of interest is that spelling has a lower correlation than any other study; reading is next, while the other four studies—arithmetic, geography, history and language—have approximately the same high degree of correlation among themselves. The low correlation of spelling is very likely due to the fact that it is so largely dependent upon illogical, or pure unaided, retentiveness, while the other studies are more dependent upon reasoning, logical memory and divers associations.

In conclusion, it would seem that mental functions are not as minutely specialized as has recently been assumed. It is quite probable that there are certain large groups of functions which are very closely correlated among themselves, but which may not be very closely correlated with functions of other groups. At any rate, it is highly imperative that the entire field of correlations should be gone over again by making more accurate and more complete measurements.

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[3] E. L. Thorndike. *Educational Psychology*, 1903, Ch. IV.

ABSTRACTS AND REVIEWS.

J. O. Vertes. *Das Wortgedächtnis im Schulkindesalter.* Zeitschrift für Psychologie, 63: October, 1912. 19-128.

This monograph gives a detailed report of an experimental study on the word memory of children, conducted during the period from October 22, 1906, to March 11, 1907. As subjects for the study, two groups of school children, totaling 128, from the ages of 6 to 11 years, and evenly distributed over the first six grades of the city schools, were selected by their teachers. This selection was made from several different types of schools, so arranged as to give about as many children of well-to-do parentage as of poor parentage. The groups included 80 boys and 48 girls.

Aim.—To determine (1) the extent or range, (2) reaction time, and (3) general memory efficiency of school children; also the relation of each of these factors to age, school grade, general school ability, sex and social status.

Method.—The "sense word-pair method" was used, the experimenter pronouncing to the subject a pair of words (catch word and reply word), *e. g. blau-rot, gross-klein,* etc., indicating to the child that on later hearing the first word he is to reply with the second or reply word. Definite explanatory tests were first given to make clear what was to be done. Test material consisted of five sets of word pairs, the first two sets of six pairs each and the last three of nine pairs each, 39 pairs in all. Extent of memory was tested by giving words after an interval of 24 hours and of one week, time being recorded and answers entered as correct, incorrect or corrected. Test words were so selected as to avoid (1) any aid through association; (2) repetition of test words; (3) similar sounding words; (4) words which could be reversed or combined; (5) words of more than one meaning.

Organization of Data.—In working up the material the writer used the Ranschburg formula for memory efficiency, which takes account of the time reaction as other formulæ do not: $M = \frac{A}{T}$; where

M = memory efficiency; A = extent of memory; and T = time. In computing A, however, a separate formula was used, $A = p + \frac{c}{2}$ where p = precise answers and c = corrected answers. It will be noticed that the corrected answers were arbitrarily scored as of half value of correct answers.

From various tabulations of his data the writer discusses in detail the extent, time and general memory efficiency, analyzing the differences in rate of learning, span of apprehension, difficulties in results in each case as to grade, age, sex, general school ability and social status. In addition to the above essential elements he also gives the correlations of the corrected, incorrect and absolute O-reproductions, a discussion of the rôle of retention and of the effect of the adjustment of the subjects to their work.

Conclusions.—1. Extent of Memory: (a) The extent of memory varies directly with school grade. (b) It varies directly with age, from 6 to 11 years. (c) A close parallel is found between extent of memory and school ability. (d) The range of memory in girls is somewhat greater than that of boys. (e) Children of well-to-do parents excel those of poor parents.

2. Reaction Time: (A) Correct Reproduction. Relation of time to—(a) School grade: Time shows constant decrease with rising grades. (b) Age: Time varies inversely as the age with boys and with girls to age of 10-11 years, there being a sharp break in the time curve at this point. (c) Curves show shorter reaction time for pupils of better general school ability, less difference being noted among pupils of grades V and VI than among those of the lower four grades. (d) Sex: Girls react more quickly than boys. (e) Well-to-do pupils react more quickly than poor pupils.

(B) Relation of extent of memory to time: The relationship is shown in general to be inverse.

3. Memory Efficiency.—Using the Ranschburg formula, $M = \frac{A}{T}$, the general memory efficiency of the subjects ranged from 8.25 per cent. to 76.9 per cent., the probable mean being 42.85 per cent. and the greater part of the results ranging from 40 to 60 per cent.

General Conclusions.—Memory efficiency varies directly with (1) school grade (from grades I to VI); (2) age from 6 to 11 years;

(3) general school ability; (4) girls have a higher memory efficiency than boys; (5) children of well-to-do parents show higher efficiency than those of poor parents.

The care which was taken to secure data under normal school conditions, and the minute analysis to which the data were subjected, make this study a contribution of value. It is quite evident, however, that further experimentation is necessary in the correlation of word memory with sex and social status. On the meager data secured by the writer one hardly seems justified in making broad generalizations.

HAROLD O. RUGG.

University of Illinois.

STUART A. COURTIS. *Report on the Courtis Tests in Arithmetic.* A Part of the Report of the Hanus Commission on Educational Aspects of the Public School System of the City of New York. New York: Committee on School Inquiry, 1913. Pp. iv, 158.

In the preface to his report Mr. Courtis calls attention to the novel and specific character of work with educational tests, and to the necessity of understanding the tests themselves in order to evaluate the results obtained from their use. Accordingly he devotes 30 pages to a history and description of the tests, and in this section presents perhaps the most detailed and elaborate account of their construction that has yet been published. In view of the fact that the report is not accessible to the general public, and perhaps will not be for some time, the following summary of average scores is presented:

Grade.	No. tested.	1. Add.	2. Subtr.	3. Mul.	4. Div.	5. Copy.	6. Sp. Reas. Att.	6. Sp. Reas. Rt.	7. Fund. Att.	7. Fund. Rt.	8. Reas. Att.	8. Reas. Rt.
IV.....	5396	41.9	29.5	28.7	26.6	75.35	3.5	1.8	8.8	4.2	3.1	.7
V.....	5836	50.2	36.8	35.0	34.7	85.5	4.4	2.3	10.9	5.8	3.1	.9
VI.....	5670	56.9	41.0	38.3	39.7	92.5	5.1	3.0	12.5	7.0	3.1	1.3
VII.....	4771	62.2	45.8	40.9	44.6	100.	5.5	3.7	14.0	8.5	3.3	1.7
VIII.....	4502	69.5	52.2	45.8	50.9	106.8	6.0	4.4	15.7	10.1	3.5	2.1
IX.....	440	71.6	52.2	46.5	52.5	98.8	6.1	5.1	15.7	10.9	3.6	2.5
X.....	257	71.7	55.3	46.8	52.7	104.5	6.0	5.1	16.1	11.5	3.5	2.6
XI.....	179	73.9	55.2	48.6	54.2	109.4	6.2	5.1	15.4	10.5	3.6	2.7
XII.....	120	74.2	54.1	46.6	55.0	105.6	6.7	5.7	16.0	11.0	3.8	2.7

The author does not stop with a mere presentation of his results in tabulated form. More than half of the report is devoted to a discussion of the results and a retabulation of the data from different points of view. The great overlapping of grades which is seen in the detailed tabulations reveals the low efficiency of arithmetic work in the schools. This is due to the fact that the same amount and char-

acter of work is offered to all pupils without any regard to individual differences in arithmetical ability. The result is a selective response in the capacities developed and great unevenness in the product. In this respect New York is no worse than other places where the tests have been tried. Rather it is a general uniformity of routine in the teaching of arithmetic which is here revealed, and the results point to a lamentable neglect of individual differences in pupils, and of the adjustment of arithmetic work to their needs and capacities. Classes move as wholes, and this treatment results in some pupils being undertrained and others overtrained. Ideally each pupil should have just training enough to bring his attainments up to standard, but this involves a study of individual capacities which is attainable only by the use of scientific tests.

Other interesting features of the report are a comparison of reasoning with fundamentals (New York children excel in the former, but are below standard in the latter), a study of relative accuracy (in which the pupils tested rank low), the influence of abstract work on reasoning, the diagnosis of individual defects, records of growth in arithmetical ability, defects in the course of study, the effects of special classes, special methods of drill, and the evidence of sex differences. A very important and illuminating chapter deals with the results of tests applied to selected groups of employes in Wanamaker's department store, New York City. In these the antagonism between routine and reasoning came clearly to view.

On the whole the report is a noteworthy contribution to the experimental study of school activities, and it is devoutly to be hoped that the Board of Estimate will authorize the printing of a sufficient number of copies to enable the study to be widely read and thoroughly digested. J. C. B.

F. H. Hayward. *The Psychology of Educational Administration and Criticism.* With an Introduction by John Adams. London: Ralph, Holland & Co., 1912. Pp. xvi, 592.

This unique book is described on the title page as a "Sequel to the Holmes Circular." From this one might infer that it is largely controversial in its character; as a matter of fact the author has gone far beyond the limits indicated by his sub-title, and has produced a keen, clear-cut analysis of the factors involved in school supervision. The Holmes Circular furnishes an admirable text for the discussion,

but we venture to predict that Dr. Hayward's book will be remembered long after the circular that inspired it has been forgotten.

The question at issue in the Holmes circular has reference to the relative value of general culture and specialized training and experience in qualifying a candidate for an inspectorship of elementary schools. Mr. Holmes, it seems, favors the attitude of "complete detachment" that may characterize the candidate who has not been subjected to the specific discipline of the work that he is delegated to supervise. An inspector of this type is much more likely, Mr. Holmes believes, to approach his work with "freshness and originality," and hence with a measure of efficiency otherwise lacking.

Part I of Dr. Hayward's book considers in three chapters the implications of this doctrine of "complete detachment." While granting the importance of the broad foundation, he argues clearly and convincingly for the primacy of specific preparation and discipline.

In Part II—Studies in Egoism—the author makes a distinct contribution to the theory of administration. If the psychology and pathology of egoism supplies the key to most of the secrets of adult life, it must, he believes, also supply the key to many administrative secrets. Hence he devotes five chapters to a description of the egoistic attitude. Parental egoism, professional egosim (represented by the priest, the physician, the lawyer), official egoism, the egoism of the critic, of the criticized, of the blunderer, and of the inefficient, are illustrated by pointed examples. That "human egoism is, perhaps, the most serious hindrance to educational progress" is a safe inference to draw from the evidence presented.

Another hindrance, scarcely less significant, is discussed in Part III, Studies in Educational Opinion. The present chaotic condition of educational theory—the lack of agreement upon the most fundamental issues among those who write upon the subject—is revealed by clear-cut analyses of typical doctrines now in the field. The chapter devoted to the educational maunderings of Bernard Shaw is especially good.

Part IV deals with the theory of educational statistics, separate chapters being given to a readable exposition of the frequency curve, variability and correlation.

The remainder of book—more than one-half in all—is made up of fifteen chapters dealing with the general problems of administration. The relation of teacher to supervisor, the factors that condition ap-

pointment and promotion, salaries, examinations and inspections are among the topics treated.

Aside from the vivacity and freshness of its style, the chief merit of Dr. Hayward's book is the balance that it preserves—an expression of the clear perspective through which the author views a most complicated and difficult problem. One feels that one is following the competent craftsman whose intimate mastery of a specialized technique justifies his irritation at those who, without serving an apprenticeship, insist on blundering their way through a maze of unfamiliar details. Too many of our educational books are amateurish, and consequently valueless; they lack craft spirit and craft pride. Laymen might have written them—and most of them have been written by men who are in effect laymen. As a result, our discussions seldom rise above the amateurish level. We are continually starting; we seldom arrive. Dr. Hayward has served his apprenticeship and writes out of his experience; but the wealth of allusion and citation from non-professional literature with which he reinforces his judgments proves that he is no narrow-visioned specialist. We need more of this kind of writing in education; and we need it from men who, like Dr. Hayward, are not afraid to call meddling and muddling by their right names, and to tell amateurs when it is time for them to quit playing with intricate machinery.

W. C. B.

E. W. Scripture. *Stuttering and Lisping.* New York: Macmillan, 1912. Pp. 250.

Dr. Scripture has here given us a most useful and timely contribution to the theory and treatment of speech defects. The book is remarkable, in that it represents the results of many years of research by a psychologist-physician, is full of original ideas, serves as a manual for the physician and clinical psychologist, and yet is written in such simple and lucid style that every public school teacher should be able to read it with pleasure and get much immediately usable knowledge from it.

The book is divided into three parts. The first treats of stuttering and the second of lisping, while the third contains specific exercises for clinical use. Stuttering, including stammering, is found to be essentially an anxiety-psychosis. The whole treatment is based on this theory and consists in the establishing of self-confidence, self-

control, correct use of the organs of speech, etc. Negligent lisping, organic lisping, neurotic lisping and "cluttering" are described as different speech defects, and at every point suggestions for treatment are offered. The section on exercises is full and clear and will undoubtedly prove exceedingly serviceable both to the experts who treat speech defects in clinics and to teachers and parents who may be prepared to treat cases which come under their observation. Since speech defects usually develop gradually, a book of this kind will be of great service in causing the detection and early treatment of the ailment. C. E. S.

WALTER SARGENT. *Fine and Industrial Arts in Elementary Schools.* Boston: Ginn & Co., 1912. Pp. 132.

There is little doubt that the motor or constructive aspect of human thought has suffered in American education. In spite of our boasted practicality (which by our detractors is denominated sordid money getting), our elementary education has been dominated by traditional subjects for which a formal rather than a utilitarian value has been claimed. One of the great services which psychology has rendered education lies in the destruction of this belief in formal values and the revaluation of school subjects in terms of their actual contribution to the development of behavior. In this the arts are beginning to receive their tardy but deserved recognition. Modern psychological theory is laying more and more emphasis upon the motor aspect of consciousness, and education is slowly endeavoring to incorporate this theory into the actual training of the youth. The little work under review forms a noteworthy contribution to the development of this movement, in that the attempt is made to establish every phase of art instruction upon the interests and capacities of the child.

Chapter one contains a general discussion of the values of fine and industrial arts in education. Heretofore art instruction has been relegated to special teachers, and the work has been casual, fragmentary, haphazard, and regarded with indifference, if not opposition, by regular teachers. Now it is coming to be recognized as a vital part of school work, and the public is taking the stand that the person who cannot sing, draw, paint and model has no business in school teaching. In our best training schools for elementary teachers these subjects constitute an important part of the curriculum, and candidates are rigidly examined for proficiency in them. What,

then, are the functions of the various subjects taught under the head of manual arts in elementary schools? How can instruction be organized so that progress shall be evident from year to year? What are reasonable standards of attainment at any given stage? These are the fundamental questions which the remainder of the book attempts to answer, and the answers offered deserve the careful consideration of every student of child behavior. In each of the grades from I to VIII the abilities of the child are examined from the four points of view of representation, construction, design and color, and an effort is made to adjust the school work to the child. Drawing is a form of language, and undergoes changes similar to language. At first it is wholly imaginative, and the child's tendency to illustrate ideas by crude pictographs should be encouraged. There should be much drawing by the teacher, not for copy, but to stimulate drawing activity and to furnish mental standards. In the middle grades the drawing becomes increasingly representative, and more attention may be paid to accuracy of form. It is a mistake, however, to imagine that one draws what one sees. Drawing is always selective, and those aspects of the object must be seized upon which will best represent the idea in the child's mind. The emphasis throughout is on the expressive rather than on the receptive side. The statement that "the child must be taught to see" is inaccurate. Rather must he be taught to select certain aspects of the manifold which he sees, and this selection must be determined by what he desires to represent. In the higher grades the play spirit gives way to more purposeful activity, and with increasing control and technical facility emphasis can be laid upon proportion, the representation of the same object in different positions, map drawing, the use of shadows, blueprint work, descriptive, memory and imaginative drawing. Rapid sketching is urged in place of an excessive amount of slow, painstaking work. Above all, it must not be forgotten that ability in exact delineation comes only from exact reproduction, that rapid sketching is learned only by rapid sketching, and that facility in expression is gained only by much drawing from memory and imagination.

The discussions of construction, design and color are full of valuable suggestions from the psychological point of view, and the work as a whole constitutes an excellent illustration of the type of pedagogical monograph which may be expected from earnest, progressive teachers who are alive to the psychological aspects of their work.

J. C. B.

THE
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EDITORIAL.

RESOLVED: THAT CHILDREN SHOULD CHOOSE THEIR PARENTS.

The present interest in eugenics gives fresh significance to the saying that a child ought, in all justice, to have some voice in the selection of his parents. Pending the elaboration of some plan which will make this possible, a little attention might profitably be devoted to the problem of what parents should be chosen, provided the choice were given. The eugenist would doubtless answer this question with a nicely-balanced series of equations, in which all desirable unit-characters would gradually resolve themselves into the superman. Let us leave him to this task, and humbly content ourselves with an examination of that ubiquitous record of achievement (and near-achievement), *Who's Who in America*.

In this volume one finds the names of some 18,000 men and women who are assumed to stand out from their fellow-countrymen because of something that they have accomplished. Taking this assumption at its face value for the sake of the story, and assuming that any prospective human being who might be endowed with the power of choosing his parents would desire to attain at least this measure of

distinction, let us see whether a study of this volume will provide him with a criterion for choice.

Unhappily, while most of the men and women here listed kindly inform us as to the names of their parents, only a small portion give us the data that our prospective superman might use. But a few do happen to furnish one of these data—they state the occupational group to which their fathers belonged. This information they give, sometimes directly, but more often indirectly; that is, by stating the title of the father—Doctor, Reverend, Professor, Captain, Judge, Honorable, and the like. It is fairly safe to assume that most of those with titular parenthood give the titles in naming their fathers. In any case, it is safe to assume that those who do not give these titles when they might are fairly equally distributed among the "titled" occupations.

Having employed a few hours of our abundant "academic leisure" in making a count (we took about 3000 names on a random picking, and found that the proportions did not vary significantly after the first 500), we are prepared to say that the prospective candidate for distinction in America would do well to choose as his father either a clergyman or an army officer or a naval officer. The clerical group, while represented by only three in the thousand of the occupational population, appears to furnish about 55 in the 1000 of "eminent" men and women. This would have to be corrected, of course, for the celibacy which is imposed upon a proportion of the group; and if this correction were made, the good showing of clergymen's families would be even more striking. The medical group (even counting as physicians all those who are given the title of "Doctor,"—and some of these are probably clergymen and not physicians)—appears to furnish, in proportion to its numbers, a little more than half as many men and women of eminence as the clerical group. The academic group makes only a fair showing,—but one cannot safely generalize because of the relatively large occupational group which teaching represents; and the loose use of the generic title of "Professor" precludes us from making special groupings.

Men in public life seem to possess fairly good advantages as parents (measured by our present standard), but on the whole the anxious candidate for the eminence of "Who's Who" would better choose either the clerical or the medical group,—unless he take the military and naval group, which appears on the surface to be by far the best

of all. But here again it is difficult to generalize. Is a "captain" a military or naval officer, or is he a lake captain or a police captain,—or a captain of industry? Is a "Colonel" a professional soldier, or is he a merchant who has served for a brief period in the militia,—or is he a colonel by "courtesy"? With "Reverend" and "D.D.", however, there can be no doubt; and, because of the regularity with which clergymen's children pop up as eminent men or women, it is our opinion that this is the group to choose.

Nor does it seem to make much difference in what specific group the candidate for eminence wishes to cast his adult career. The clerical group furnishes nearly as many eminent physicians and surgeons in proportion to its numbers as the medical group; more eminent jurists absolutely than jurists themselves; a goodly sprinkling of eminent engineers; a few eminent farmers; some captains of industry; and college professors without number.

What the orthodox eugenists of the Galton persuasion would advance in extenuation or condemnation of the clergy for thus seeming relatively to monopolize this field is perhaps an idle speculation. Our directory is well within Galton's standard: its names aggregate one in the five thousand of the population, while he was satisfied with one in the four thousand as the criterion of eminence. Does the clerical group as contrasted (for example) with the medical group, "select" a type possessing hereditable characters making for eminence?—or, more justly, did it select such a type forty, fifty, or sixty years ago at the period when the leaders of the present generation were "a-borning"? The contention is plausible; but common sense suggests at once that the superior culture, discipline, and training which the members of this group commonly furnish for their children are equally plausible as conditioning factors. Granting somewhat exceptional native capacity, these seem to be the factors that "load the dice." And, if those to whom we delegated the problem of discovering a means by which children could choose their parents find the task a trifle too difficult for immediate solution, is it too much to suggest that (pending the final balancing of dominants and recessives in the eugenists' equation) leisure to devote to one's children, knowledge with which to inform them, culture with which to inspire them, and *the deepest sense of responsibility for their well-doing* may, if represented as effectively in the general population as in this single occupational group, help the race on a bit toward the era of the superman? W. C. B.

NOTES AND NEWS.

In the University Exposition, held this spring at the University of Kansas, the School of Education, under the directorship of Dean Charles Hughes Johnston, played a prominent part. The main sections of the educational exhibit were History of Education in Kansas, shown by charts, maps, photographs, text-books, etc.; Educational Psychology and Mental Tests, in which demonstration and test apparatus were so arranged that actual tests could be made; School Hygiene and Physical Tests, School Administration and Statistics, Relation of School and College, and the Practice School. Such exhibits are of value not only in acquainting the people at large with the work done in a modern department of education, but in convincing some of our skeptical academic brethren that education is taking itself seriously.

The Annual Swarthmore Conference of Teachers was held at Swarthmore College, April 26, 1913. Features of the conference were addresses by Stanley R. Yarnall on "The School from the Classical Standpoint," W. D. Lewis on "The School from the Industrial Standpoint," and Robert C. Brooks on "The Teacher and the Cost of Living."

At the meeting of alienists and neurologists, held under the auspices of the Chicago Medical Society, June 23-25, 1913, the following topics were included among the discussions: "Ways and Means of Preventing Physical and Moral Degeneracy," by G. M. Hill; "Some Data Gathered in a Study of 269 Murderers," by Rock Slyster; "Are Criminals Insane Individuals?" by C. H. Anderson; "Constitutional Immorality," by Paul E. Bowers; "The Proper Care and Sterilization of Mental Defectives," by H. M. Cary; "The Need of Some Systematic Method to Determine the Mental Integrity of Employes of Railroads and Other Transportation Companies," by Theo. Diller; "The Psychological Clinic as a Eugenic Agency," by Clara Harrison Town; "The Diagnosis of Feeble-mindedness," by Henry H. Goddard; "Some Types of the Feeble-minded," by C. B. Caldwell; "Inheritance of Some of the Elements of Hysteria," by C. B. Davenport, and "Social Hygiene as an Aid in Preventing Mental Diseases," by William House.

The subject of co-education or the segregation of the sexes in school work is a vital one and has been the occasion of much heated argument. What fragmentary experimental evidence we have on it seems to show very little difference between boys and girls in psychological and pedagogical aspects. A noteworthy attempt is now being made to collect all this evidence and sift it according to scientific standards. At the third German Congress for Paidotechnics and Paidology (Association for School Reform), which is to meet at Breslau, October 4-6, 1913, two days are to be devoted to the subject of "The Difference Between the Sexes and Its Significance for Public Education." In connection with this there is to be a scientific exhibit of materials and data contributing to a "comparative paidology of the sexes." The exhibit will include: (1) Graphic representations of the results of experimental or statistical investigations on the psychology of the sexes. (2) Comparative collections of drawings, modelings, literary productions, handwork, technical constructions, etc., of boys and girls. (3) Comparisons of grades, class standings and school exercises in mathematics, languages, etc. (4) Comparative studies of expression, as in handwriting, speech, etc. (5) Materials on comparative criminal psychology and moral statistics of boys and girls. An effort will be made to collect specimens of work from children of all ages from kindergarten to university, from the abnormal as well as the normal, and from all types of social condition. The Institute of Applied Psychology, Berlin, under the supervision of its director, Dr. Otto Lipmann, is preparing extensive charts for the graphic representation of data to be found in the literature of the subject.

Prof. G. M. Whipple's Manual of Mental and Physical Tests has been translated into Russian.

WHEN SHOULD A CHILD BEGIN SCHOOL: A CORRECTION.

On page 370 of the June number of the JOURNAL I am printed as saying: "And in any case my method of measuring school progress weighted for age could not be used to test the value or otherwise of preliminary kindergarten teaching in the large cities of the States." As the whole point of the argument rests upon the assertion that it could be so used, the substitution by the printer of *not* for *now* has had a result more confusing than printers' errors usually are.

W. H. WINCH.

CURRENT PERIODICALS.

(In this section only such articles will be noticed as bear directly or indirectly upon the interests of this Journal.)

THE JOURNAL OF EXPERIMENTAL PEDAGOGY. Vol. I, No. 1, March, 1911. W. H. WINCH. *Social Class and Mental Proficiency in Elementary School Children.* 9-18, 118-128. A comparison of examination marks to determine the differences in mental ability referable to differences in social status. Pupils of the same school were divided into two classes according to the kind of house in which they lived. The "poor" children were older for their grade than the better class children, and in general showed less proficiency in their studies. The greatest inequalities were found in arithmetic, spelling and composition.

KATHARINE L. JOHNSTON. *Mr. Binet's Method for the Measurement of Intelligence.—Some Results.* 24-31. A preliminary study of two hundred and eighteen girls from six to sixteen years of age on the basis of the 1908 tests. The seven-year tests seem too easy, while those for ten and twelve years are too difficult.

P. SANDIFORD. *Measurement in Education.* 31-38, 215-222. A study of the heights and weights of fifty Manchester grammar-school boys is made the basis for a discussion and exemplification of the methods of statistical manipulations in educational investigations.

GLADYS W. MARTIN. *The Evidence of Mental Fatigue During School Hours.* 39-45, 137-147. Tests were made on seven children, each twelve years old, at 9.45, 11.45 and 3.45 each day for seventy-six days. The tests were (1) copying a pattern in such a way that the chief factors involved were speed and accuracy of perception; (2) space threshold of the skin; (3) speed of multiplication, using the Kraepelin reckoning books; (4) dynamometer and ergograph tests. The results were negative in all cases, *i. e.,* there was no evidence of depreciation due to fatigue in any of the activities tested.

C. BURCHENOUGH. *The Psychological Bases of School Geography.* 45-51, 128-136. An interesting experimental study of the sense of direction and orientation in young children, and the application of this to geographical orientation. Few children under sixteen think of direction apart from some conventional representation of it. The globe is essential in gaining clear ideas of direction.

W. G. SLEIGHT. *Memory Training—Is It General or Specific?* 51-54. A condensed account of extended experiments in immediate and delayed recall, with children and adults, practiced and unpracticed. There was no general improvement of practiced over unpracticed subjects, but practice in poetry and tables increased efficiency in nonsense syllables (where rhythm was prominent), and practice in prose substance *diminished* ability for mechanical memorizing, *i. e.,* nonsense syllables.

No. 2, November, 1911. C. BURT. *Experimental Tests of Higher Mental Processes and Their Relation to General Intelligence.* 93-

112. An important investigation of the reasoning activities of nearly 100 boys and girls from 11.5 to 13.5 years of age in two Liverpool schools. Fourteen tests were used, many of them new, and the correlations of results were carefully worked out.

E. P. Culverwell. *The Creation of a Memory.* 160-161. A brief account of a very interesting experiment in developing a language memory in a boy who was decidedly defective in this respect, but otherwise above the average ability.

No. 3, March, 1912. P. B. Ballard. *What London Children Like to Draw.* 185-197. A study of the drawing interests of 20,000 children between three and thirteen years. Nine classes of objects are considered, and the preference curves at different ages throw much light upon mental development.

G. Rossollimo. *Mental Profiles.* 211-214. A graphic method of representing mental ability as determined by thirty-four tests. The device deserves careful attention and study by all those who are interested in mental tests.

Edmund J. Gill. *Methods of Teaching Reading.* 243-248. An experiment in rate of reading unspaced prose.

No. 4, June, 1912. W. H. Winch. *A Motor Factor in Perception and Memory.* 261-273. New material is better observed and remembered by drawing or writing it rather than by merely looking at it. If the material is relatively familiar, the writing or drawing is a hindrance rather than a help.

Cyril Burt and Robert C. Moore. *The Mental Differences Between the Sexes.* 273-284, 355-388. A discussion of the theory of measurement of sex differences is followed by a survey of the results of experimental investigations up to date, and a tabulation of the authors' own observations. With few exceptions innate sex differences of mental constitution are surprisingly small, and they tend to diminish as we pass upward from simple processes of sensation and movement to the more complex processes of reasoning.

P. B. Ballard. *Sinistrality and Speech.* 298-310. A statistical investigation shows that stammering is much more frequent among left-handed than right-handed children. It is rare among those who always write with the left hand, but frequent among those left-handed children who have been taught to write with the right hand. Writing should always be done with the superior hand exclusively.

Edmund J. Gill. *The Teaching of Spelling.* 310-319. An experimental test of the spelling efficiency of school children and an analysis of the errors made. Children taught to read by the sentence method can spell as well as, if not better than, children who have been taught synthetically.

A. P. Weiss. *The Ebbinghaus Conjectural Method of Examination.* 320-334. Several illustrations of the "conjectural" or completion method lead to the conclusions that it (1) saves the time of both student and instructor, (2) rewards consistent work and penalizes sporadic methods of study, (3) shows high correlation with the

marks which might be expected from a study of the normal curve, and (4) enables the student at all times to estimate his own standing in class. It is held to be superior in every way to the usual question and answer method of examination.

No. 5, December, 1912. George Rutherford Jeffrey. *Some Observations on the Use of the "Reckoning Test" with School Children.* 392-396. Eighteen children, nine boys and nine girls, were divided into three groups (bright, average and dull), and were tested for 15 minutes on each of five consecutive days with the Maloney modification of the Kraepelin Reckoning Test. The bright boys were very much better than the bright girls, but the average and dull girls surpassed the average and dull boys. The improvement for boys was, bright, 90.9%; average, 62.9%; dull, 47.4%. That for girls was, bright, 58.9%; average, 67.2%; dull, 91.1%.

Vol. II, No. 1, March, 1913. James Drever. *Notes on the Experimental Study of Writing.* 25-29. A description of a new method of registering writing pressure and a criticism of the Thorndike scale. The apparatus for indicating pressure avoids the movable writing surface, and takes the reading directly from the pencil point.

No. 2, June, 1913. W. H. Winch. *Should Young Children Be Taught Arithmetical Proportion? Part I.* 79-88. A theoretical analysis of the beginnings of proportional association, and a series of experiments with first-grade children to test the validity of this analysis. The results show that such children have a somewhat surprising facility in dealing with the conditions of proportion.

E. O. Lewis. *Popular and Unpopular School Subjects.* 89-98. A statistical study of the preferences of 8000 pupils from grades II to VII (7-14 years) gives the following ranking, beginning with the highest: Drawing, manual subjects, history, reading, singing, drill (physical exercise), arithmetic, science, nature study, dictation, composition, Scripture, recitation, geography, grammar. The reasons for these rankings form very interesting reading.

C. W. Valentine. *Experiments on the Methods of Teaching Reading.* 99-112. An experimental test of the phonic method of teaching reading as compared with the "look and say," or word method. Selections of simple English were written in Greek characters in such a manner that if the proper sounds were given the Greek letters the English word would be pronounced. Tests were made on adults, elementary school children and kindergarten children. The results were strikingly in favor of the phonic method for all except the very dull children.

B. Dumville. *A Trial of Binet's Tests on Five-Year-Olds.* 113-118. The tests were used to compare two parallel classes in an infant school. The number of children tested was 89. Three children showed a mental age of 4, 15 of 5, 41 of 6, and 30 of 7. The average age was 6.1, showing that these tests are too easy. The fact that just as many correct answers were received from the seven-year tests as from those for six years points to a serious defect in the scale. The

Spearman foot-rule correlation between the results of the tests and the ranking of the teacher was only .43.

ROBERT R. RUSK. *Analysis of the Spelling Errors of Adults.* 119-122. Errors due to faulty expression included (1) words not completed, (2) words wrongly completed, and (3) words substituted for those given. Those due to faulty apprehension resulted from (1) improper pronunciation, or (2) defective phonetic analysis.

STANLEY WYATT. *The Correction of Errors.* 122-127. A series of experiments involving the effect of practice with and without knowledge of results in accuracy of movement, spelling and arithmetic. The greater improvement where the results are known affords a strong argument for correcting papers and requiring pupils to study the corrected forms.

P. B. BALLARD. *What Children Like to Draw.* 127-129. An examination of 10,000 drawings of Welsh children, who were asked to draw whatever they preferred, reveals the same types of preference as London children show (see above). The boys' favorite object for drawing is a ship; the girls' some form of plant life. Nine is the age of minimum interest in drawing human beings. Eight years is the age of maximum interest in drawing both houses and animals. Fondness for sketching vehicles is greatest at six.

SCIENCE. N. S., Vol. xxxviii, August 1, 1913. DEXTER S. KIMBALL. *Practical Work in Science Teaching.* 144-149. Science teaching should not become abstract and formal, should not lose its intimate touch with practical affairs, but on the other hand it should not fall into the opposite error of dwelling too much on the concrete. In all the present emphasis upon the interest of the pupil we must not forget that "nothing worth while has ever been gained without toil, trouble and tears."

August 15, 1913. FREDERIC LYMAN WELLS. *The Principle of Mental Tests.* 221-224. Two broad functions of psychological tests are (1) the measurement of changes in individuals under controlled conditions, and (2) the measurement and interpretation of differences between individuals under similar immediate conditions. The problem is to construct a test that shall be free from inaccuracies and at the same time significant for the subject's adaptation to life. The interpretation of tests is, therefore, as important as their application. The tendency to make tests approximate the conditions of practical life is a commendable one.

August 29, 1913. GEORGE W. CRILE. *A Mechanistic View of Psychology.* 283-295. Psychology must be redefined as the science of man's activities as determined by the environmental stimuli of his phylogeny and of his ontogeny. The author develops a theory of brain patterns, each with its own connection with the external world, each attuned to receive impressions of but one kind. Thought, will, perception, memory, emotion, reason, and the like, are to be interpreted in terms of these brain patterns, and depend on the stimuli which are able to secure the final common path.

PUBLICATIONS RECEIVED.

(Notice in this section does not preclude a more extended review.)

FRANK P. BACHMAN. *Intermediate Schools.* New York: Committee on School Inquiry, 1913. Pp. 43.

Intermediate schools in New York City are schools in which seventh and eighth year pupils are segregated. There are three such schools, organized to relieve congestion. Not only have they done this, but they have demonstrated their value by holding and promoting more pupils than the ordinary school, by a saving in cost of equipment and operating expenses, and by increased opportunity to vary the work of the school to meet the needs of the public.

BIRD T. BALDWIN. *John Locke's Contributions to Education.* Reprinted from the Sewanee Review, April, 1913. Pp. 13.

Locke, who has been cited as a typical representative of formal discipline in education, seems to have had a clear realization of the limitations of training, and to have anticipated some of the current theories as to the importance of studying the pupils' native propensities. Indeed his injunctions to "observe carefully for favorable seasons of aptitude and inclinations" and "teach the child when he is in tune" seem to point to a theory of nascent periods of instinct every whit as fantastic as that which is so prominent in contemporary educational discussions.

W. BECHTEREW. *La psychologie objective.* Paris: F. Alcan, 1913. Pp. iii, 478. Fr. 7.50.

Dr. Auguste Marie, in his preface to this volume, proclaims it "the text-book of the psychology of tomorrow." We are assured that the old psychology which looked within, which dealt with the phenomena of consciousness, which based its conclusions upon the methods of introspection, is antiquated and discredited. The new psychology is a strictly objective science, and reduces all mental as well as physical activities to reflexes. We have simple reflexes, instinctive reflexes (sic), neuro-psychic reflexes, mimetic reflexes, reflexes of nervous concentration, symbolic reflexes, and personal reflexes. The task of expressing thought activities in neural terms is a congenial one for a certain type of speculative mind, and may have its value in revealing new points of view for the interpretation of familiar data. We know so much more, however, about the rela-

tions between our thoughts than we do about the mechanism of reflexes, that such interpretations are as yet largely hypothetical.

SUSAN BLOW, PATTY HILL, AND ELIZABETH HARRISON. *The Kindergarten.* Boston: Houghton Mifflin, 1913. Pp. xvi, 301. $1.25. net.

Whatever may be the ultimate judgment of educators upon the Montessori methods, there is one aspect in which the present Montessori propaganda promises beneficial results for education in America. The agitation puts the old-time Froebelian kindergartner on the defensive, and provokes an evaluation of kindergarten methods. The charge has been made against the kindergarten that, although unhampered by school regulation, and furnished with unrivalled opportunities for the study of the child, it has contributed practically nothing to our scientific knowledge of child development. Doubtless the most important reason for this is the blind, almost idolatrous, acceptance by kindergartners of principles and methods bearing the stamp of the Froebelian tradition. The whole attitude has been one of the reverent study of revealed truth, rather than the scientific observation of actual children. It is true that the enthusiastic Montessori propagandist shows little superiority in this respect. But in the clash of opinion there is almost certain to be an appeal to direct observation and experiment. Even before the Montessori methods became an issue, there was dissatisfaction within the kindergarten ranks, and in 1903 a special committee was appointed by the International Kindergarten Union to "formulate contemporary kindergarten thought". This committee has persisted, with some changes in membership, for ten years, and the present volume constitutes its report. The three reports presented are supposed to represent the views of the Conservatives, the Radicals, and the Harmonists, but an examination of the book shows 230 pages devoted to Miss Blow's Conservative report, and only a scant 70 pages to the other two positions. Nevertheless it is a book which cannot be ignored by anyone who is interested in primary education, for it contains a summing up of all Miss Blow's past efforts, and a concise statement of the position of the insurgent kindergartners from the pen of Miss Hill. Is it not time for some experimentalist to attack the kindergarten problem?

Carnegie Foundation for the Advancement of Teaching. Seventh Annual Report of the President and Treasurer. New York: Carnegie Foundation, 1913. Pp. 194.

This report is especially valuable for its extended and well-balanced discussion of pension systems and their application to proposed state pension funds for teachers. Several pages are also devoted to the perplexing subject of college entrance requirements.

Specific subject requirements for entrance put a premium upon mediocre teaching in some subjects and handicap good teaching in others. Colleges should put the stamp of their approval upon good teaching in all subjects, and should endeavor to detect and eliminate poor teaching even in the most traditional and best organized fields.

GEORGE VAN NESS DEARBORN. *Kinaesthesia and the Intelligent Will.* Reprinted from the American Journal of Psychology, Vol. 24, April, 1913. Pp. 204-255.

An excellent summary of the literature on the dependence of volition upon the great stream of impulses connected with movement, an analysis of the neural substrate of volition, and a discussion of some simple experiments involving will acts.

CHARLES DE GARMO. *Aesthetic Education.* Syracuse: C. W. Bardeen, 1913. Pp. xi, 161.

Every child should have a first hand aesthetic view of the world, and it is under the influence of the teacher that this can be acquired. Our present aesthetic teaching is partial and second hand, depending on pictures of things rather than on things themselves. The writer attempts to reveal to teacher and pupil the beauty to be discovered in some of the common things of life, and one of the most interesting portions of the book is the chapter on the aesthetic proportions of tools, machines, and engines. A feature of the book is the introduction of a considerable number of original poems illustrating the aesthetic response to various situations.

DR. GUSTAV DEHNING. *Bilderunterricht. Versuche mit Kindern und Erwachsenen ueber die Erziehung des aesthetischen Urteils.* Leipzig: Quelle und Meyer, 1912. Pp. 108. M. 3.50.

This important experimental study of the aesthetic judgment investigates the questions: To what degree can the child give an aesthetic response to a work of art; at what age does this response first manifest itself, and what are its stages of development; to what extent can the response be hastened or intensified by training? Among the author's conclusions we find the following: Artistic appreciation begins not earlier than the tenth year; at thirteen there are evidences of spontaneous evaluation of art works; and from sixteen on artistic discrimination may be taught to all. The rate of improvement correlates closely with general intelligence, as indicated by class standing. No sex differences appear. The descriptive type of mind is not so favorable for artistic appreciation as the contemplative or the emotional. For young children a picture merely tells a story and has no aesthetic value, but for older children specific instruction has a decided place in developing the criteria of the aesthetic.

WILLIAM ELLSWORTH HERMANCE. *An Unorthodox Conception of Being.* New York: G. P. Putnam's Sons, 1912. Pp. x, 441. $2.50 net.

The fundamental ethical doctrine of this unorthodox philosopher is freedom from fear, and on this account his book is to be commended to the consideration of educators. "There is one thing we will recognize which I think is an equal barrier to manifestations of aspirations and inspirations, and this is, I believe, a psychic entity which I term Fear." Fears are the great inhibiting factors which crush us down, and hinder our mental, moral and spiritual progress. Hence the great ethical task is to cast out fear, and in this Faith and Love are the attitudes that must be emphasized. The author does not hesitate to frankly confess when he gets into difficulties, and the common sense way in which he graples with some of the fundamental problems of human thought inspires confidence.

IRVING KING. *Education for Social Efficiency.* New York: D. Appleton & Co., 1913. Pp. vii, 311. $1.50 net.

This is a popular discussion of various aspects of education from the standpoint of social needs. The author states in his preface that the book is not so much for the educational specialist as for busy teachers. However this may be, the book contains a clear and simple statement of some of the most important problems in current educational practice, and excellent illustrations of the manner in which these problems may be successfully attacked. After a consideration of the social origin, function and aim of education, the author turns to the rural school situation and points the way to a more highly developed social consciousness. In general the need for co-operation of the school with home and community is stressed and the utilization of social interests and incentives in the internal life of the school is urged. It is a very practical and helpful book.

VARIA KIPIANI. *Ambidextrie. Etude experimentale et critique.* Paris: F. Alcan, 1912. Pp. 104. Fr. 3.50.

A detailed examination of the physiological and neurological bases of right and left handedness, and a discussion of the pedagogical treatment adapted to these conditions. There seems to be undoubted evidence for anatomical and physiological asymmetry, but the author claims that education should endeavor to counteract this and to develop a symmetrical physique. The illustrations of simultaneous writing and drawing with both hands are interesting, if not altogether convincing as to the value of such education.

EDOUARD LEROY. *The New Philosophy of Henri Bergson.* Translated from the French by Vincent Benson. New York: Henry Holt & Co., 1913. Pp. x, 235. $1.25 net.

We have here the enthusiastic and somewhat impressionistic interpretation of a poetic philosopher. If ardor of conviction and

warmth of allegiance count for anything in the propagation of philosophical ideas, Mr. Bergson is to be congratulated upon his interpreter. And this seems to be appreciated, for in a letter to the author Mr. Bergson says: "Underneath and beyond the method you have caught the intention and the spirit. * * * Your study could not be more conscientious or true to the original. Nowhere is this sympathy more in evidence than where you point to the possibilities of further developments of the doctrine."

JAMES H. LEUBA. *A Psychological Study of Religion.* New York: The Macmillan Co., 1912. Pp. xiv, 371. $2.00 net.

This is a remarkable book, and it is certain to have a profound influence upon all thoughtful people who come in contact with it. The essential and inherent conflict between the dogmas of Christian theology even in its most modern and attenuated form and the findings of the psychology of religion is clearly pointed out, and the pathetic case of the religiously disposed scientific thinker who tries to adjust himself to any of the accepted creeds makes one pause and reflect. One of the most striking tendencies of modern education is the development of an attitude of respect for scientific truth and scientific method. This, from the nature of the case, is bound to continue, and in this way there is a growing antagonism between the basic principles of the school and the church, which reacts disastrously upon the moral and religious nature of the pupils. One of the greatest needs of the coming generation is a form of religion which will not be felt to conflict with scientific ideals, but will be based upon them, and will be big enough to include and foster them. A possible satisfaction of this need is offered in the author's suggested Religion of Humanity.

GEORGE EDWIN MACLEAN. *Present Standards of Higher Education in the United States.* Bulletin No. 511. Washington: Bureau of Education, 1913. Pp. 191.

A history of the standards of college entrance requirements in the United States, and a survey of present standards in liberal-arts colleges, and schools of theology, medicine, law, engineering, dentistry, pharmacy, fine arts and music.

DAVID R. MAJOR. *The Elements of Psychology.* Columbus, Ohio: R. G. Adams & Co., 1913. Pp. xiii, 413.

The present volume is an addition to the rapidly increasing number of introductory texts in general psychology. The treatment follows the traditional divisions of the subject matter, and is based largely on James and Titchner. Practically no account is taken of contributions published in recent periodical literature. The chapter on the nervous system contains some good cuts, but unfortunately

the full-page diagram intended to show the connection between the spinal cord and the brain is so unduly simplified as to be altogether misleading. It is somewhat surprising to find a psychologist saying: "We agree to call the consciousness which the light of a bright moon may arouse in the mind of a week-old babe—Sensation." We suggest with Royce, that it would be as well to leave the hypothetical babies out of the discussion.

ELEANOR MARCHBANKS. *School Ethics.* Boston: The Four Seas Co., 1913. Pp. 178. $1.25.

This little book represents one elementary school teacher's reaction to the problems of teaching right conduct in the public schools. The chief means employed seem to have been the judicious selection of stories, memory gems, etc., in the English work, and the emphasis on kind and thoughtful action in the composition lessons. Primary teachers will find some interesting material for story-telling in the volume. One feels that the title is somewhat pretentious for the simple tone of the book.

JULIEN OFFRAY DE LA METTRIE. *Man a Machine.* Chicago: The Open Court Publishing Company, 1912. Pp. 216.

The publication of the French text and an excellent translation of this famous work is opportune in view of the present day interest in mechanism. The book is attractively printed and bound. Frederick the Great's "Eulogy" of La Mettrie and extracts from "The Natural History of the Soul" are included. An appendix contains philosophical and historical notes by Gertrude Carman Bussey, and also a bibliography.

LAWRENCE MILLS. *Our Own Religion in Ancient Persia.* Chicago: Open Court Publishing Company, 1913. Pp. 193.

This book, by the professor of Zend (Avesta) at the University of Oxford, contains a collection of lectures delivered on various occasions for the purpose of showing the connection between Israel and Persia, and the identity of the "chief doctrines of the Avesta and the Exilic Bible."

A. C. MONAHAN. *The Status of Rural Education in the United States.* Bulletin No. 515. Washington: Bureau of Education, 1913. Pp. 73.

The author presents statistical tables comparing urban and rural schools, discusses the one-teacher country school, outlines the essentials of efficiency in rural schools, indicates the status of the rural teaching force, and sketches the status of rural school management and supervision.

GARRY C. MYERS. *A Study in Incidental Memory.* Archives of Psychology, No. 26, February, 1913. Pp. 108. $1.00.

This interesting monograph presents valuable material for the educational psychologist and the teacher. "The findings of this study seem to strike a blow at the common assumption that because a person does certain acts or work within a certain system, it necessarily follows that he has an intimate knowledge of the activity or system with which he is identified. For example the sixth grade teacher may be an expert in her teaching activities, but this fact does not insure her expertness in the capacity of analyzing the problems and existing conditions of sixth grade school work in general. These analyses may best be made by one whom is free from the daily routine of teaching."

ANNA G. NOYES, B.Sc. *How I Kept My Baby Well.* Educational Psychology Monographs, No. 9. Baltimore: Warwick and York, 1913 Pp. 193. $1.25.

This fascinating story of the first two years of a child's life contains the most elaborate scientific record of physical health and the means used to maintain it that has ever been kept. Detailed charts are presented of the record of nine typical months. From these charts one gets accurate information of the slightest changes in such matters as number of meals, intervals between meals, duration of nursing, regurgitation and vomiting, sleep, feces, skin, cold, behavior, crying, weight, and physical achievements. A goodly number of such complete records would give us adequate basis for genuinely scientific judgments on the physical development of children.

G. H. PARKER. *The Relation of Smell, Taste and the Common Chemical Sense in Vertebrates.* Reprinted from the Journal of the Academy of Natural Sciences of Philadelphia. Vol. 15, Second Series, September 7, 1912. 221-234.

A study of the reactions of fishes to chemical stimuli shows that there are three types of chemical receptors in these vertebrates, those in the nose, in the mouth, and in the skin. Of these the olfactory organ is the more primitive, the chemical receptors of the skin seem to have developed next, and finally the organs of taste became differentiated.

G. H. PARKER. *Sound as a Directing Influence in the Movements of Fishes.* Reprinted from the Bulletin of the United States Bureau of Fisheries, Vol. 30, April 27, 1912. 99-104.

Some varities of fishes move toward the source of a sound produced in the water, some move away from it, and some are disturbed by it without showing definite orientation.

LANGDON CHEEVES STEWARDSON, L.H.D., LL.D. *College Sermons.* New York: Longmans, Green & Co., 1913. Pp. x, 332.

"The primary purpose of these sermons was to stimulate religious experience in its various phases of feeling, thought and action. * * * Religion is indigenous to human nature and not an imported product. * * * and, as a thing of life, it is subject to development. Its growth involves changes in theologic statement as well as in particular objects and methods of practical endeavor."

JOHN C. STONE, A.M. *The Modernization of Arithmetic.* New York: Benj. H. Sanborn & Co., 1913. Pp. 26. Ten cents.

Work in arithmetic is begun too early. It is the most abstract of elementary school subjects, and we would do well to wait until the child grows up to it. Much more emphasis is needed on habit formation through drill. Fundamental processes must be made automatic, and much that is traditionally included in the text-books should be eliminated.

WILLIAM S. SUTTON. *Some Principles of Moral Instruction.* Reprinted from the Educational Review, June, 1913. Pp. 9.

A masterly presentation of the fundamentals of morals in the schools. The canons of moral instruction are: 1. Sense preception is the foundation of moral wisdom. 2. Moral insight is to be gained only through the guidance of reason. 3. The emotional nature must be considered. What a man loves determines to a large extent what he will become. 4. The will must be trained. "Education has for its purpose the decrease of the number of apes, as well as the number of bosses, among men, for it is immoral for a human being to be either an ape or a boss." 5. "At all times and under all circumstances instruction should preserve, defend, and promote the moral unity and integrity of the individual."

EDWARD L. THORNDIKE. *The Original Nature of Man.* New York: Teachers' College, Columbia University, 1913. Pp. xii, 327. $2.50.

No field of educational psychology has stood in such dire need of critical examination and clarification as that of instinct. The old antithesis between intelligence and instinct received a death blow with the publication of James' chapter on instincts, and later writers have not only agreed with him that man has more instincts than any other animal, but have pointed out that intelligence itself is nothing more than the complicated interplay of responses which go back in the ultimate analysis to inherited neural structure. So completely has the conception of instinct come to dominate educational thought that such important works on the principles of education as Bolton and Henderson are permeated by it from cover to cover. But much

of the literature on instinct, particularly in its relation to education, is highly imaginative, and whole courses of study have been constructed on the basis of recapitulatory activities and nascent periods of instinctive behavior. These theories are so fascinating and lend themselves so readily to the construction of elaborate educational programs that it is almost with reluctance that one inquires what support they receive from the actual study of behavior. Yet this is the crucial question that we have needed to have asked in education, and this is the inquiry to which Thorndike has directed his attention. The task has been masterfully accomplished, and we venture the prophecy that the present volume will set the standard in discussion of instincts for many years. It is true that much of the argument is negative and destructive, and that on the constructive side the author is frequently obliged to say, "Here we need further detailed studies of behavior." But the destructive criticism was urgently needed, and will serve to clear the ground of much fictitious knowledge.

JOHN B. WATSON. *Psychology as the Behaviorist Views It.* Reprinted from the Psychology Review. Vol. 20, No. 2, March, 1913. 158-177.

"Psychology, as the behaviorist views it, is a purely objective, experimental branch of natural science which needs introspection as little as do the sciences of chemistry and physics. * * * The position is taken here that the behavior of man and the behavior of animals must be considered on the same plane, as being equally essential to a general understanding of behavior. It can dispense with consciousness in a psychological sense."

ARLAND D. WEEKS. *The Education of Tomorrow.* New York; Sturgis & Walton, 1913. Pp. xii, 232. $1.25 net.

What kind of knowledge is worth while? What kind of knowledge is of sufficient importance to warrant us in requiring the coming generation to master it? The author's answer is that it is that knowledge which assists the individual in adjusting himself to the world in which he lives. From this economic point of view three classes of educational knowledge are considered, knowledge relating to production, to distribution, and to consumption, and the subjects that are available for the school curriculum are surveyed and evaluated with reference to this distinction. The author makes many wholesome observations, but scarcely justifies the ambitious title.

ALEX. WOOD, M.A., D.Sc. *The Physical Basis of Music.* New York: G. P. Putnam's Sons, 1913. Pp. viii, 163. 40 cents net.

This little volume is one of the Cambridge Manuals of Science and literature, and presents in simple form the essential facts about the air vibrations which give rise to musical tones.

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THE MEASUREMENTS OF HANDWRITING.

DANIEL STARCH.

University of Wisconsin.

1. *Introduction.*
2. *Analysis of the Essential Elements of Handwriting.*
3. *Methods of Measurement.*
4. *Testing the Writing of a School System.*
5. *Standards of Attainment for each Grade.*

1. INTRODUCTION.

A scale for measuring the quality of handwriting would be an exceedingly useful tool for testing the efficiency of pupils in writing. It would also be a valuable instrument for the scientific investigation of the methods and factors in the learning and teaching of writing.

The pioneer contribution in this field was made by Thorndike[1], who succeeded in preparing a scale for the grading of general merit of handwriting. This scale was constructed from one thousand samples of writing, furnished by fifth to eighth grade pupils. These samples were arranged in the order of merit by forty or more competent judges. This resulted in a scale of graded specimens ranging in quality from zero to eighteen, zero being absolutely illegible and eighteen being a perfect copper plate sample. The differences between the

[1]THORNDIKE, E. L. *Handwriting.* Teachers College Record, Vol. II, No. 2, March, 1910.

successive steps of the scale are equal in amount. Thus quality five is as much better than quality four as quality twelve is better than quality eleven. A given specimen of writing is measured by putting it alongside the scale and determining to what quality it is nearest.

The scale itself has a high degree of accuracy; but in practical use two difficulties of minor importance are met. One is that, although the scale is constructed on the basis of general merit or quality, it in reality measures primarily the form or aesthetic appearance of writing. Even if one tries to avoid estimating beauty, legibility or individuality, and tries to estimate only the general merit, the chief basis of grading is still form or appearance. This criticism, however, is of little significance since form and general merit are quite closely correlated.

Another difficulty which has been urged by the critics of this and other scales is that the measurements made thereby are subject to considerable error. One individual may judge a given specimen of writing as number nine; another may judge it as number twelve. This error can be partly overcome by practice, and, as I shall point out later, is very much less than the error in the usual marking of penmanship by the teacher.

The second scale for handwriting was prepared by Ayres[2] and is a scale of legibility only. It was constructed by measuring the speed of reading 1578 samples of children's writing. The words in these samples were thrown out of their natural context. These specimens were then read by ten different persons, and an average reading time was computed for each sample, and from the entire group typical specimens were selected which represent eight equally distant degrees of legibility. The scale consists of three samples, slant, medium, and vertical, for each of the eight degrees of legibility. Measurements are made in the same manner as with the Thorndike scale.

The Ayres scale has several shortcomings. First, it does not contain enough steps, particularly at the lower end. The lowest quality in the scale is better than the majority of the writing of first and second grade pupils. Second, while the scale

[2] AYRES, L. P. *A Scale for Measuring the Quality of Handwriting of School Children.* Russell Sage Foundation, New York City.

itself is constructed on the basis of legibility it measures not legibility but rather the form or appearance of the sample. This is a more serious difficulty in the Ayres scale than in the Thorndike scale. For, the probability is that appearance is more closely related to general merit than to legibility. Third, the question must be raised whether measuring the legibility of isolated words, as was done in the preparation of the Ayres scale, is identical with measuring the legibility of words in their context. I believe they are very closely related, as I shall show in a later paragraph, but the question is a legitimate one and must be cleared up.

2. Analysis of the Essential Elements of Handwriting.

Both the Thorndike and the Ayres scales measure a single feature or a composite group of features. But in order to make a complete measurement of any sample of writing it is necessary to measure all of its essential characteristics. Handwriting is not an end in itself. It is purely an agency of communication and must therefore be measured or evaluated in terms of utility.

A simple analysis of handwriting shows that its three chief elements are legibility, producibility, and form. The first two are the utilitarian qualities, the third is the aesthetic quality. Perhaps the most important characteristic is legibility. Writing is for the purpose of reading. That writing which can be read most easily is adjudged the best. A means of measuring legibility is therefore absolutely necessary. Of almost equal importance are the ease and speed of producing the writing. The form or beauty of writing is of secondary importance although form and legibility are fairly closely correlated especially among the poorer qualities of writing.

Other characteristics such as individuality, size, style, slant, etc., are of little or no consideration from the standpoint of the prime function of handwriting except in so far as they are factors in legibility, or in producibility, or in beauty.

3. Methods of Measurements.

How may these essential characteristics be measured?

1. *Legibility.* The only attempt made thus far to measure legibility is by means of the Ayres scale. As pointed out

above, the scale itself is, no doubt, constructed accurately on the basis of legibility, but in actually rating a sample of writing with it you adjudge its form rather than its legibility.

The most obvious means of measuring legibility would be to determine the time required to read a given specimen as quickly as possible and then to compute the time per letter or per word. But this method would have the objection that it could not be used when the context of the material is familiar, nor could the measurements be repeated except after long intervals of time when the context had been forgotten. It could therefore not be used to test the legibility of the writing of a class of pupils all of whom wrote the same material.

I wish now to present some experimental data to illustrate a simple and fairly accurate means of measuring legibility by measuring the speed of reading letters. The apparatus consisted simply of a stopwatch and a circular piece of stiff cardboard, 20 cm in diameter, into which three round openings, 2.5 cm in diameter, had been punched. These apertures were made in a straight row, 1.5 cm apart, the middle one being at the center of the card. This particular size of card was chosen so as to cover practically all the writing of a given sample except that which would be shown in the openings. A circular card is better than a rectangular one because it can be placed more conveniently in any position so that the three openings can have any chance location on the sample of writing. Apertures of 2.5 cm are large enough to expose several letters and yet not so large as to expose entire words or groups of words.

The legibility of a sample of writing would be tested by placing the card in any position upon the sample and by reading as quickly as possible all the letters exposed in the openings. The time of reading and the number of letters exposed are then recorded. The card is placed in another position and the number of letters and the reading time are again recorded. Sometimes a third reading is taken. From these determinations the reading time per letter is computed. If the sample of writing is composed of repeated lines written one under the other the card should not be placed so that the openings are in a vertical row. Care must also be taken that one does not see what letters are exposed until one begins to take the reading time.

This method of measuring legibility has certain advantages. It is simple, quick, and fairly accurate. It can be repeated with the same sample as often as is desired without any disturbing effect of familiarity, and it measures what you really wish to measure, namely, legibility. It is also possible for persons of different speeds of reading to reduce their tests to a common scale by using certain common specimens.

The chief consideration regarding the validity of this method is whether the legibility of letters is the same or sufficiently closely related to the legibility of words and sentences in sensible context to afford a reliable measure. To answer this question I made the following tests. Ten different specimens of widely varying degrees of legibility were chosen from personal letters. The length of the specimens ranged between 100 and 300 letters. Each sample was read as quickly as possible and the time registered with a stopwatch. From this the time per letter was computed. Likewise each sample was measured by the above described letter-exposure method. Three separated determinations were made by both methods at intervals of approximately two weeks. The results are given in Table I.

TABLE I.

	Legibility of words in context.		Legibility of letters.	
Samples	Av.	M.v.	Av.	M.v.
1	.076	.007	.28	.02
2	.102	.005	.31	.02
3	.110	.015	.41	.04
4	.107	.006	.40	.01
5	.091	.004	.33	.03
6	.065	.005	.25	.02
7	.070	.009	.28	.01
8	.096	.003	.35	.02
9	.101	.003	.35	.02
10	.118	.013	.40	.01
Av.		.007		.02

The figures in the table give the reading-times per letter expressed in fractional parts of a second. The table shows that the legibility of letters is practically identical in relative order with the legibility of words in their context. The coefficient of correlation of the two series of measurements is +.90. The degree of reliability of the measurements themselves is high as indicated by the small mean variations, .007 and .02 on the average.

Another set of tests to demonstrate the relation of legibility of words to legibility of letters was made with the samples in the Ayres scale. As previously stated the Ayres scale is composed of specimens of uniformly increasing degrees of the legibility or words thrown out of their natural context. Each sample was measured at two different times by the letter-exposure method giving the following results:

TABLE II.

	Legibility of Letters.	
Ayres Scale.	Av.	M. v.
20	.36	.03
30	.32	.03
40	.297	.02
50	.303	.01
60	.28	.02
70	.27	.03
80	.267	.02
90	.267	.01
Av.		.02

The second column gives the averages of the measurements of the samples under each quality in the Ayres scale. The coefficient of correlation between the legibility of letters and the legibility of words is .97. The average of the mean variations is again .02.

These two tables demonstrate that the measurements themselves are accurate as is indicated by the small mean variations and that the proposed manner of measuring legibility by the letter-exposure method is a fair index of the legibility of text in its natural order.

At this point it may also be of interest to show the relationship between legibility and general merit in handwriting as represented in Thorndike's scale. To this end I measured all the samples in the Thorndike scale by the letter-exposure method, yielding the results in Table III.

The coefficient of correlation between legibility and general merit is .74. In this computation the averages in the last column (Table III) are used. This yields a higher correlation than if the measurements of the individual samples are used. In the latter case the correlation is .63.

2. *Producibility.* Economy in the production of writing can be measured by measuring the speed and ease of writing.

TABLE III.

Quality.	Sample.	Average.	
18	125	.20	.20
17	141	.255	.255
16	32	.20	
	84	.26	.275
15	49	.21	
	89	.17	
	47	.24	
	90	.23	.21
14	54	.23	
	19	.23	.23
13	55	.22	
	24	.27	
	26	.24	
	4	.27	.25
12	30	.22	
	7	.24	
	52	.21	.22
11	23	.24	
	45	.31	
	106	.27	.27
10	17	.28	.28
9	31	.25	
	21	.23	
	28	.27	.25
8	14	.38	
	48	.29	.34
7	126	.46	.46
6	12	.51	.51
5	6	.56	.56
4	121	.80	.80

The simple measurement of speed itself is for all practical purposes a fairly reliable measure of producibility. Writing produced with laborious movements cannot be produced rapidly. The simplest method for measuring the speed of writing of a group of persons is to have them all write for a definite number of minutes and then to compute the number of words or preferably letters written per minute. The letter is a better unit than the word.

3. *Form or Beauty.* This characteristic, although of less practical importance, is more difficult to measure than either legibility or producibility. From the purely practical viewpoint, beauty of handwriting is of little consequence, nevertheless our artistic sense regards that handwriting better and more desirable which has the more pleasing appearance. And, as appeared from Table III, the more beautiful writing is, up to certain limits, the more legible and, to a less extent, the more easily written.

In the investigation to be discussed presently the Thorndike scale was used for measuring over two thousand samples. The Thorndike scale is, of course, constructed on the basis of general merit in handwriting, but the very nature of using the scale makes it primarily an instrument for evaluating the form or appearance of writing just as Ayres scales, although constructed on the basis of legibility, is in its practical use chiefly a measurement of form. At any rate it is the best available means for measuring form or aesthetic appearance.

The critics of scales have objected on the ground that measurements made with them are subject to error and uncertainty and that you might as well not use them at all. It is true that any measurement is subject to error. The ultimate test of validity would be to determine whether measurements of handwriting made by any one of these scales would be more accurate than the simple evaluations in terms of marks or percentages usually made by teachers.

A comparison of this kind was made in the following manner: Fifteen specimens of handwriting were obtained from pupils in the public schools of Madison. Two sets of judges, consisting of ten business men and ten teachers, graded these specimens in three different ways: (a) by the Thorndike scale, (b) by the Ayres scale, and (c) by the usual percentile method used in school. It was explained to the judges that 100% would represent perfect writing and zero would be absolutely illegible or unintelligible writing.

Ten business men were included among the judges in order to obtain estimates from the practical view point as well as from the view point of the school.

To make the gradings as fair as possible the order of the scales was varied for each judge. That is, one judge would grade all samples first by the Thorndike scale, second by the Ayres scale, and third by the percentile method. The next judge would grade first by the Ayres scale, second by the percentile method, and third by the Thorndike scale, etc. The specimens were also shuffled before proceeding from one scale to the next.

To illustrate the kind of results obtained we may notice the ratings of one sample made by the ten teachers according to

each of the three methods of measurements: By the Thorndike scale, 8, 9, 9, 8, 8, 10, 8, 8, 8, 7; by the Ayres scale 30, 30, 20, 30, 20, 50, 30, 30, 30, 30; by the percentile method 30, 35, 73, 50, 50, 70, 60, 68, 70, 25.

These measurements may seem to vary rather widely, particularly those obtained by the percentile method, but these variations are no greater than they would be in the case even of a mathematics paper, as has been shown by extensive tests.[3] Table IV. gives the results[4] in a comprehensive form.

The relative as well as the absolute accuracy of measurements made with the different scales is indicated by the mean variations. In order to make these mean variations comparable it is necessary to reduce them all to terms of the percentile method. This was done by multiplying each mean variation by a certain constant which expresses the relation between the scales. To illustrate how this constant was obtained it will be noticed that on the percentile scale 0 is understood to mean absolutely illegible writing and 100 means perfect copper plate writing. On the Thorndike scale 0 corresponds to 0 on the percentile scale and quality 18 corresponds to 100 on the percentile scale. Hence one step on the Thorndike scale is equivalent to 5.5 points in the percentile scale, and, therefore, the mean variations for the Thorndike scale would have to be multiplied by 5.5 to make them directly comparable with the mean variations for the percentile method. In case of the Ayres scale this constant is more difficult to determine because we do not know whether 100 would be perfect writing or whether 0 would be zero on quality. The relation, however, can be determined accurately from the measurements as follows: Specimen No. 4 is the best one of the fifteen and is ranked by the business men as 66, Ayres scale, or 71.5, percentile method. Specimen No. 15 is the poorest and is ranked as 22, Ayres scale, or 34, percentile scale. Hence the difference between 66 and 22, or 44, is equivalent to the difference between 71.5 and 34, or 37.5. Hence one point on the Ayres scale is equivalent to .85 points on the percentile scale. By

[3] See STARCH AND ELLIOTT, *Reliability of Grading Work in Mathematics.* School Review, April, 1913, p. 254-259.

[4] These measurements and computation were made with the assistance of Mr. W. C. Koepke, to whom much credit is due.

TABLE IV.

		Business Men.			Teachers.		
		T.	A.	%	T.	A.	%
1.	Av.	10.	43.	50.8	10.	53.	68.9
	M. V.	1.	6.8	10.1	1.	11.6	9.7
	M. V.*	5.5	5.8	10.1	5.5	9.1	9.7
2.	Av.	10.8	55.	60.	11.7	61.	76.1
	M. V.	.7	7.	11.	.7	5.4	9.3
	M. V.*	3.8	5.9	11.	3.8	4.2	9.3
3.	Av.	8.6	30.	40.5	8.3	30.	53.1
	M. V.	.6	4.	11.2	.6	4.	15.1
	M. V.*	3.3	3.4	11.2	3.3	3.4	15.1
4.	Av.	12.4	66.	71.5	12.8	76.	83.3
	M. V.	1.04	8.8	7.8	1.1	8.	6.4
	M. V.*	5.8	7.5	7.8	5.9	6.3	6.4
5.	Av.	10.1	50.	59.6	10.1	54.	70.9
	M. V.	.9	8.	9.8	1.1	6.8	10.7
	M. V.*	5.	6.8	9.8	5.9	5.4	10.7
6.	Av.	11.6	58.	67.2	11.8	63.	78.
	M. V.	.7	10.	9.8	1.	7.6	8.4
	M. V.*	3.9	8.5	9.8	5.3	6.	8.4
7.	Av.	9.	40.	51.	10.	43.	66.2
	M. V.	.8	6.	10.	1.	7.	13.
	M. V.*	4.4	5.1	10.	5.5	5.5	13.
8.	Av.	9.6	49.	56.	10.2	51.	72.2
	M. V.	.7	7.2	9.6	.8	7.4	10.2
	M. V.*	3.8	6.1	9.6	4.4	5.8	10.2
9.	Av.	9.	35.	50.	9.1	44.	63.3
	M. V.	.6	10.	10.	.6	7.2	11.6
	M. V.*	3.3	8.5	10.	3.5	5.7	11.6
10.	Av.	10.9	48.	60.5	11.8	70.	80.
	M. V.	.9	6.8	7.6	.8	6.	7.
	M. V.*	5.2	5.8	7.6	4.6	4.7	7.
11.	Av.	8.8	32.2	45.5	8.7	42.	58.4
	M. V.	.7	6.8	9.4	.7	12.	14.4
	M. V.*	3.8	5.8	9.4	3.8	9.5	14.4
12.	Av.	8.1	32.	42.8	8.4	34.	54.5
	M. V.	.5	8.8	11.7	.6	6.8	16.2
	M. V.*	3.	7.5	11.7	3.6	5.3	16.2
13.	Av.	8.8	38.	48.3	9.4	44.	64.9
	M. V.	.7	5.2	11.6	.8	5.6	7.5
	M. V.*	3.9	4.4	11.6	4.2	4.4	7.5
14.	Av.	9.7	48.	56.	9.6	47.	67.9
	M. V.	1.1	.8	7.3	.8	6.2	10.7
	M. V.*	6.1	6.8	7.3	4.4	4.9	10.7
15.	Av.	7.3	22.	34.	6.9	22.	41.1
	M. V.	.6	3.2	13.8	.4	3.2	17.9
	M. V.*	3.1	2.7	13.8	2.1	2.5	17.8

*Mean variation of Thorndike and Ayres scales in terms of the percentile scale.

T=Measurements with the Thorndike scale.

A=Measurements with the Ayres scale.

%=Measurements with the percentile method.

comparing the next highest with the next lowest sample, etc., an average constant was computed which in the case of the business men was .85 and in case of the teachers was .79.

It was also found that the 0 point and the 18 point on the Thorndike scale did not correspond exactly to the 0 and the 100 points on the percentile scale. By a comparison similar to the one made for the Ayres scale it was found that the constant should be 8.2 for the business men and 7.25 for the teachers, instead of 5.5. Thus the second mean variations given in the table are directly comparable since they are reduced to exactly the same terms.

The average mean variations for the fifteen samples are expressed in the following table. All are reduced to the terms of the percentile method.

Judges.	T. scale.	A. scale.	% scale.
Business men	6.32	6.04	10.04
Teachers	5.66	5.49	10.30

From these figures it can be seen that the measurements made by either one of the scales are approximately twice as accurate as those made without a scale. The gradings made by the teachers and the business men are almost identical in all essential respects. These results demonstrate beyond dispute the far greater accuracy of measurements by means of these scales. Furthermore we should also notice that the judges were not practiced in the use of the scales. Familiarity with the scales reduces the error to nearly one-half.

In support of this point it is interesting to note that the probable error of the ratings of three samples made by fifty-four persons was .9 of a step on the Thorndike scale, whereas the average deviation of my own ratings of these three samples from the average of the fifty-four was only .6. My own ratings were made after I had had the practice of rating over 2,000 samples.

We may thus conclude that after some practice in the use of a scale the measurements with either scale are from three to four times as accurate as the evaluations made by the usual percentile marking system.

4. Testing the Writing of a School System.

A sample of handwriting was obtained under specified laboratory conditions from every pupil in the first to the eighth grades in the schools of Madison, a total of 2190 samples. These specimens were obtained at the end of the school year, June, 1912, so that it would be possible thereby to establish definite standards of attainment in writing for each grade. For this purpose it was obviously better to produce the samples at the end rather than during the school year.

The specimens were obtained by the teachers according to the following typewritten directions which were placed into their hands.

Writing Test.

Give date, name, and grade at the top of the paper.

Each pupil is to write "Mary had a little lamb" repeatedly for two minutes.

To get an accurate record of the time the teacher should see that each pupil is ready with pen and ruled paper. At the signal from the teacher all should begin. They should write as well as they can, and without interruption at natural speed for two minutes, when the teacher will give the signal to stop.

All writing was done on regular foolscap in ink excepting in the first and in several second grades where the pupils had not yet begun to use pen and ink. The time limit of two minutes was chosen because it was short enough to avoid fatigue and long enough to give a sufficiently large sample for all purposes of measurement. In order to obtain a test of speed it was necessary to use something that could be written from memory. Either copying or dictating would interfere with the natural speed of writing. The line "Mary had a little lamb" was chosen because it would be familiar to even the youngest pupils.

I then measured the speed, legibility, and form of each sample, requiring altogether hours upon hours of close application. The speed is indicated in the tables as so many letters per minute. The form is measured in terms of the Thorndike scale by the ascending-descending procedure. That is, a group of thirty or forty samples was taken and each one was graded by beginning at the lower end of the scale and ascending until the quality was reached to which the sample was judged equal. After the entire group had been rated in this manner, each

sample was judged again by beginning at the upper end of the scale and descending until equivalence was established. The average of these two determinations was taken as the final measurement. It is believed that this method yields considerably more accurate results than a single comparison of the sample with the scale.

The legibility is indicated in terms of the reading time per letter as determined by the letter-exposure method. In order to avoid any effect of fatigue of the eyes upon the measurements, the legibility tests were never continued longer than an hour at a time.

Tables V, VI and VII give the combined results. The different schools are indicated by letters at the left. The grades are numbered across the top. The blank spaces in the tables are due to the erroneous performance of the test in those particular grades.

TABLE V.

Speed of Writing. Letters per Minute.

Schools.	Grades. 1	2	3	4	5	6	7	8
A	12.9	31.5	32.9	35.3	39.4	51.8	65.3	84.6
B	22.1	30.8	31.7	30.6	43.7	49.7	72.9	90.7
C	18.4	21.6	25.5	44.3	44.2	59.6	86.9	86.7
D	19.4	40.8		36.2	63.9	57.9	82.2	87.3
E	16.0	38.0	40.7	47.7	56.0	83.0	81.7	89.6
F	14.7	41.7	39.4	40.3	49.8	52.4	80.3	87.6
G	21.6				56.0	50.2		
H	15.1	25.4	33.8	41.7	42.3	90.2	88.9	79.6
I	25.4	33.5	34.9	31.1	55.8	64.4		
J	27.5	34.4	33.6	54.3	55.4	57.2	76.7	72.0
Average	19.3	33.1	34.0	40.2	50.6	61.6	79.4	84.8

Figure 1 represents the curves plotted from the averages of the three tables. They are drawn in such a way that the beginning and the end points of the three curves coincide. This makes it possible to compare directly the relative rates of improvement in the three elements of writing from grade to grade. The grades are given along the horizontal base-line and the scales to which the curves are drawn are indicated on the left side.

These curves bring out several interesting facts. In the first place it is quite evident that the improvement in the three factors is not simultaneous. There is relatively little improvement in speed in the first three years but after that it increases very rapidly up to the seventh grade. The eighth

TABLE VI.

Form of Appearance of Writing. Thorndike Scale.

Schools.	Grades. 1	2	3	4	5	6	7	8
A	6.9	7.2	7.8	8.4	9.1	9.2	9.3	9.3
B	6.4	7.6	8.1	8.5	8.7	9.5	9.4	10.1
C	6.3	7.8	7.9	8.2	9.1	9.6	9.8	9.9
D	5.4	7.1		8.8	9.3	10.8	10.5	11.6
E	6.1	7.3	6.3	8.6	9.9	10.0	10.1	11.2
F	5.6	7.1	7.9	8.9	9.4	10.2	10.0	9.8
G	5.6				8.0	10.7		
H	5.9	8.6	7.7	9.1	9.7	8.9	10.9	10.2
I	5.7	7.0	8.4	8.2	9.1	9.6		
J	6.5	7.3	8.1	8.8	10.0	9.9	10.2	11.0
Average	6.0	7.4	7.8	8.6	9.2	9.8	10.2	10.4

TABLE VII.

Legibility of Writing. Time per letter (seconds.)*

	Grades. 1	2	3	4	5	6	7	8
A	.52	.34	.28	.27	.29			.295
B	.45	.40	.30	.29				.28
C	.38	.32	.28	.29				.28
D	.56	.35		.29				.28
E	.53	.34	.37	.28				.28
F	.50	.35	.33	.30				.28
G	.60							
H	.56	.33	.326	.28				.29
I	.59	.37	.31	.30				
J	.45	.35	.29	.275	.27			.27
Average	.514	.35	.31	.286				.282

grade gains relatively little over the seventh. Improvement in form is more steady but it is somewhat more rapid at first and quite small in the last year. Improvement in legibility takes a very different course. It increases very rapidly in the first two years and then more gradually, reaching practically its height in the fourth year. After that there is almost no improvement in legibility. This is due largely to the fact that after the improvement in form has reached a certain stage, approximately quality ten or even less, there is no longer any gain in legibility. Specimens better in form than quality ten are about alike in legibility.

Figures 2, 3, and 4 show interesting sex differences. The girls are superior to the boys in each instance, particularly in form. The difference in speed is perhaps negligible. The superiority of the girls is perhaps due to their somewhat

*The legibility of grades five, six, and seven was not measured as there is no improvement after the fourth grade.

greater diligence and interest in aesthetic form and possibly also to their tendency toward earlier maturity.

Table VIII gives the correlations between the various elements of writing and between writing ability and scholarship. These coefficients were computed on the basis of the pupils of the third and seventh grades in schools C, F, and H, a total of 144 pupils.

TABLE VIII.

Writing and scholarship	.31
Speed and form	.10
Speed and legibility	.12
Form and legibility	.34

Writing is apparently not as closely correlated with other studies as the latter are correlated among themselves. The correlations among such studies as arithmetic, geography, etc., are between .70 and .85. There is practically no correlation between speed and form or speed and legibility. This was to be expected since increase in speed tends to reduce form and legibility. But a fast writer is apt to be a better writer than a slow writer when the former writes at the slow speed of the latter.

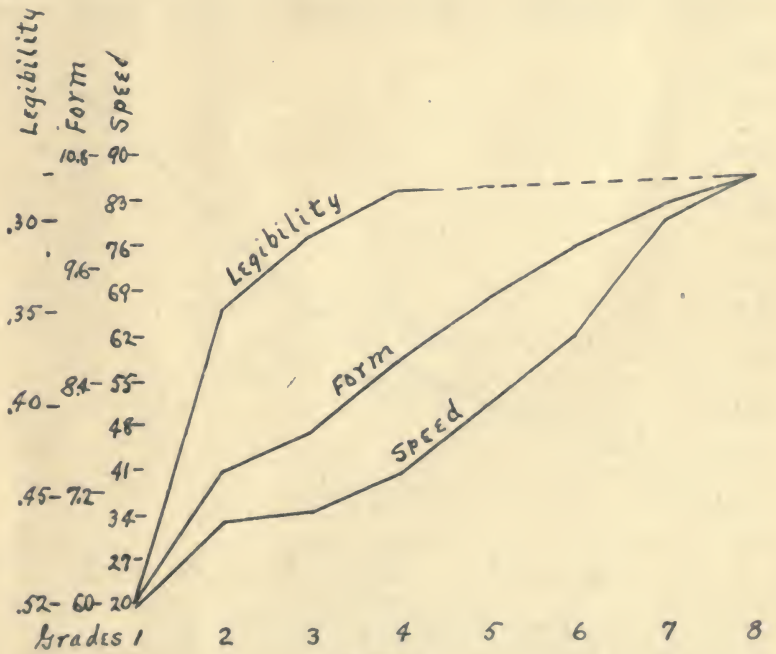

FIGURE I.

Thorndike[5] states that among adults the correlation between scholarship and handwriting is zero. Gesell's[6] study of children's writing shows about the same correlation as that in Table VIII. Both are probably correct. The little correlation that exists in case of the children is probably due to instruction and is largely lost in adults.

5. Standards of Attainment for Each Grade.

What is needed in every branch of instruction in the public schools is a definite standard of attainment or efficiency to be reached at the end of each grade. If we had such standards and if we had adequate means of precisely measuring efficiency it would be possible for a qualified person to go into a school room and measure the ability in any subject and state on the basis of his measurements whether the pupils are up to the standard, whether they are deficient, how much and in what specific respects. How this may be done with handwriting in an accurate way is the purpose of this section.

1. *How Obtain Standards?* We might set the standard of efficiency for a given grade in one of two ways. We might arbitrarily estimate or state that in a given grade a pupil

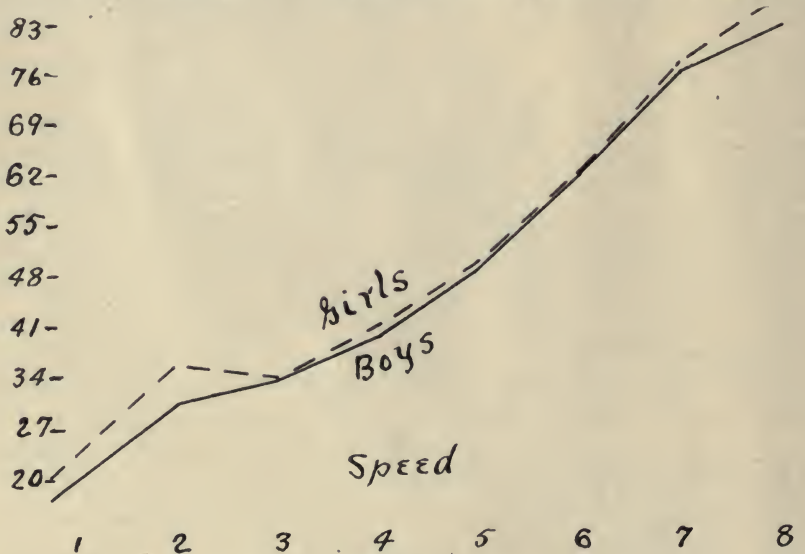

Figure II.

[5] *Handwriting.* Teachers College Record, II, No. 2, p. 39.

[6] *Accuracy in Handwriting, as Related to School Intelligence and Sex.* Am. J. of Psy., Vol. 17, 394-405.

should reach a certain speed, a certain degree of legibility and a certain standard of form. Or, we might find out what the average efficiency of a very large number of pupils at their best is in speed, legibility, and form, and take these averages as standards. The latter is the only feasible and just method and is the one used here for determining the standards of efficiency in handwriting in each grade. An arbitrary standard might be too high or too low. An empirical standard tells you what it is actually possible for the average pupil to achieve under favorable conditions.

The standards that will be used here are the ones obtained from the entire school system of Madison. As such they cannot be regarded as universal standards, for such could be determined only by combining the measurements of many different school systems. But probably the deviation of the Madison standards are not very marked from the composite standards that would be obtained from many places. For the present we may regard them as tentatively valid standards.

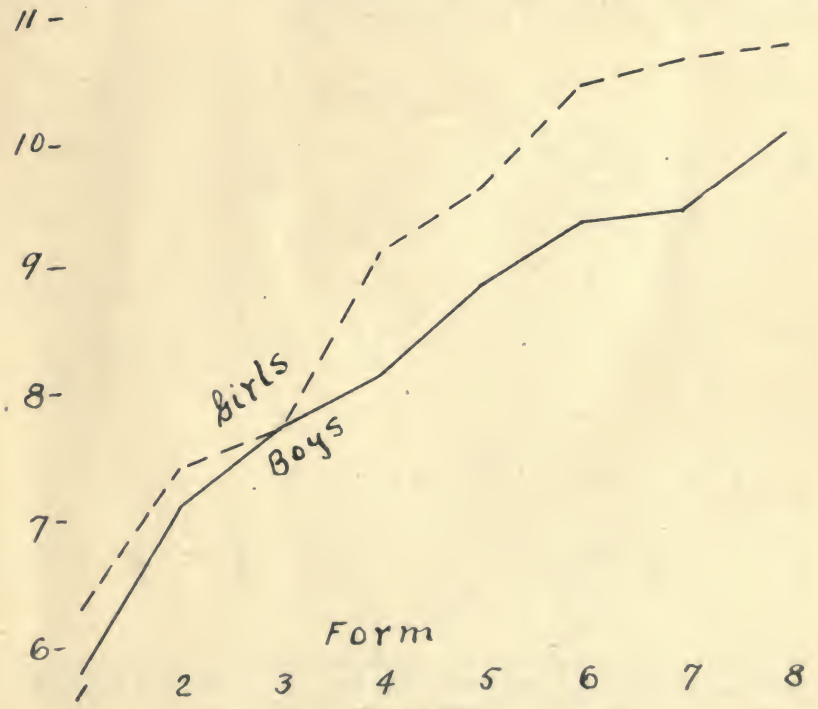

FIGURE III.

A composite set of standards can now easily be obtained as we have the tools of measurement at hand. A continuation of this work is now in progress.

2. *Method of Plotting Graphs.* The degree of efficiency of a given pupil, grade or school can be most simply represented by a series of graphs. Figure 5 shows a standard graph chart. The vertical columns represent the eight grades. The three horizontal lines are the scales for the three elements of writing: speed, legibility, and form. The division marks on each scale are so placed that the middle point of any column represents the average standard of attainment for that grade. These averages are taken from Tables V, VI, and VII. The numbers on the scale for speed are letters per minute, those on the scale for form are the numbers of the qualities in the Thorndike scale, and those on the scale for legibility are hundredths of a second which express the reading-times per letter.[7] Thus the graph of a pupil in the fourth grade who is exactly up to the standard in every respect would be a straight line down the middle of the fourth column.

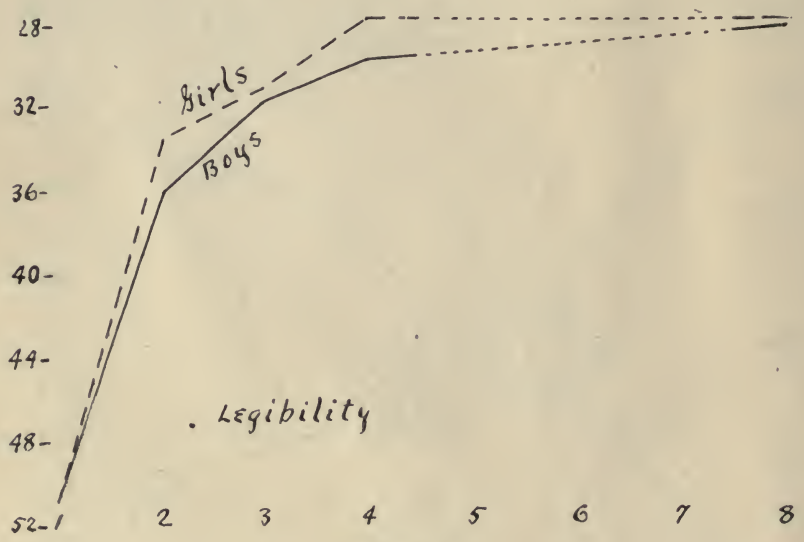

FIGURE IV.

[7] If any one wishes to make his measurements of legibility comparable to the ones in the chart he can reduce them to the basis of this standard graph chart by comparing his speed of reading with my own by means of the samples in the Ayres and the Thorndike scale. See Tables II and III.

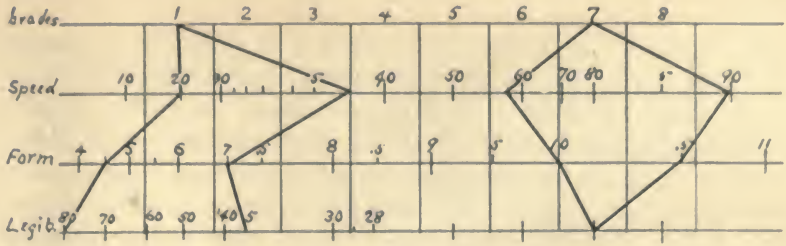

FIGURE V. Individual pupils in same school.

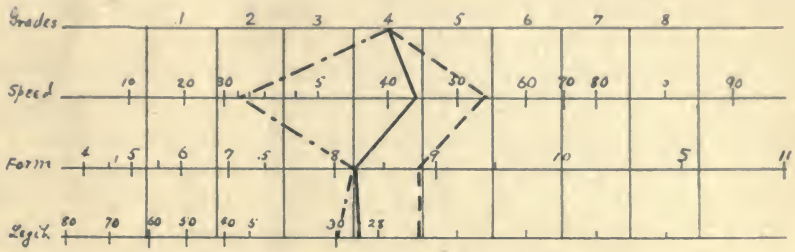

FIGURE VI. Averages of 4th Grade in
School J — — —
" C ———
" I —·—

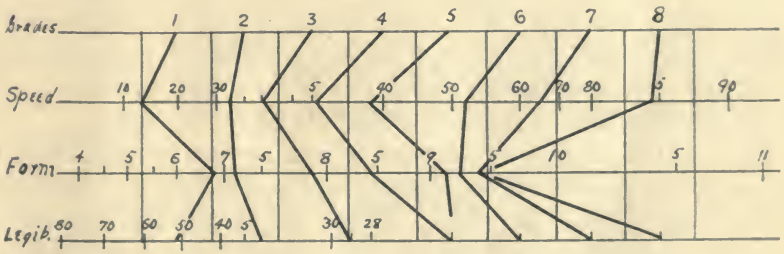

FIGURE VII. Grade Averages of School A.

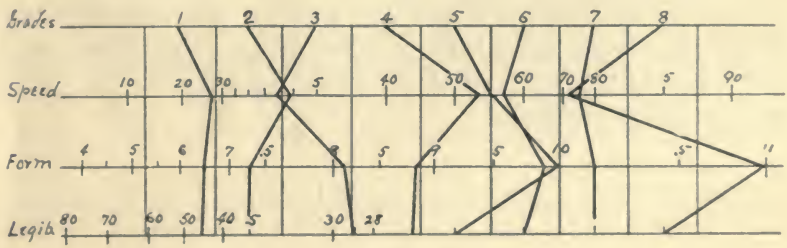

FIGURE VIII. School J. Grade Averages.

By means of this standard chart it is possible to measure rather precisely the actual attainment in handwriting of individual pupils as shown in Figure 5, or of an entire grade as shown in Figure 6, or of an entire school as shown in Figures 7 and 8. Figure 5 shows how widely individual pupils in the same school and grade differ and particularly in what respects they differ from the standard scores for their particular grades. Thus the first pupil in grade one is up to standard in speed but very deficient in both form and legibility. The second pupil is nearly up to the fourth grade in speed and up to second grade in form and legibility. Figure 6 shows a startling difference among the fourth grades of three schools. Thus the fourth grade in school I is very deficient in speed, being no better than the standard attainment for the second grade. The fourth grade in school C is up to standard in every respect, and the fourth grade in school J is up to fifth grade in speed and a trifle above average in form and legibility. Figure 7 shows that almost every grade in that school is below standard in speed. Figure 8 likewise indicates many defects.

The advantages of a precise method of measurement in terms of a standard chart of attainment are quite obvious. A teacher can thereby measure the progress of the pupils from time to time, she can see in what particular respects the pupils either individually or as a class are deficient. She can compare her grade with the same grade in other schools. And finally it furnishes a definite standard to strive for.

It gives the principal a means of measuring the efficiency of the various grades in his school and consequently will make better supervision possible. Above all it affords the means for the scientific investigation of methods and conditions of teaching writing.

In order not to overburden the individual teacher any more than at present, we may some day have an educational testing laboratory connected with the office of superintendent whose duty it would be to test efficiency in all school subjects by more or less precise methods.

A REAL PROBLEM FOR EDUCATIONAL PSYCHOLOGY.[1]

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As a teacher of psychology in a normal school I am naturally most concerned about that phase of psychology that we conveniently call educational psychology. The teacher of psychology in an institution for the training of teachers is first of all interested in those aspects of the science that have a direct guidance value for actual educational procedure, those phases of the subject that throw light on the question as to how the actual work of the common school teacher is to be made more efficient. In our normal school curricula psychology is included under the head of the so-called professional subjects, on the assumption that it will be of real, practical help to the teacher trying to do his work. If it is to be of help to him in his work, we must keep in mind just what that work is, and especially what the most important phases of that work are. Probably no one that has given the matter of education serious consideration will doubt that the most important and at the same time the most difficult part of that work is that of trying to realize the aim of moral education or social education, call it what you will.

And that is why one of the most important considerations, if not the most important consideration, of educational psychology should be the problem of the sources of human conduct. The men and women engaged in the actual work of teaching children and young people are everywhere confronted with the demands for a more efficient moral education. They are ready to admit the justice of the demands, but they cannot help asking: "How are we to bring it all about?" They turn, not only to the educationist, but as well to the psychologist, for help, asking for light on the problem of the sources of

[1]Read at the joint meeting of the Western Branch of the American Psychological Association and the Association of Teachers of Psychology in Normal Schools and Colleges, held at Evanston, Ill., March 21 and 22, 1913.

human conduct, for they realize as we may not that the crux of the whole problem of moral education lies right at this point. We certainly cannot deny that, if the developing of morals is really as important as we claim it to be, we ought to devote a considerable time to the psychology of conduct, or behavior, in other words, to make a psychological study of the springs, or sources, of conduct. Anyone who, with this in mind, has made it a point to examine our standard works in educational psychology, even those of most recent appearance, cannot have failed to be struck by the almost universal neglect of this particular problem, the very one that looms up largest in our minds when we consider the real purpose of the study of psychology in our institutions for the training of prospective teachers. I confess to a similar feeling of disappointment and misgiving at the absolute omission of any reference to such a problem in the report of the committee of the American Psychological Association on the teaching of psychology, submitted about three years ago.

We teachers of psychology in normal schools serve as a sort of buffer, as it were, placed between the university psychologist, on the one hand, and the prospective teacher of children on the other. The latter is to be prepared for his work by us. We cannot give that preparation unless the former, the academic psychologist, gives us what we need for that preparation. And our most urgent need now is more light on this problem of the springs, or sources, of human conduct. In the absence of such a psychological basis for educational principles all talk about a science or art of education is mere bombast and fustian. Now to be candid we must admit that there is little indeed in psychological literature and in that of the kindred branches of science and philosophy that is available in convenient form to give to our teachers so as to help them out in their plight. The standard works on ethics do not approach their problem from this particular angle, and so they have little to offer in a shape to be utilized for guidance in the actual work of teaching. Such inquiries as Bosanquets' "Psychology of the Moral Self," Irons's "Psychology of Ethics," Prof. Davies's "The Moral Life" will be found on examination to be not concerned with this our specific problem. Mei-

nong, Ehrenfels, Eisler, Urban, in their excellent treatises on the psychology of values; Sutherland, Hobhouse, Westermarck, in their masterful works on the evolution of morals; Tarde, Le Bon, Baldwin, Ross, Simmel—all of them deal with aspects of the moral life that have a most direct bearing on our problem of the psychology of moral development, but someone must first work this material into desirable shape to make it available as a practical aid in the solution of our problem. The application of the methods of experimental psychology to the study of educational questions marked an important transition in the history of pedagogy; but this particular mode of research has thus far thrown little or no light on the problem under consideration. Even when we examine such eminently valuable works as Dr. Lay's "Experimentelle Didaktik" and Meumann's "Vorlesungen" with the hope of receiving assistance at this point we are doomed to disappointment.

When we take a look at the history of the question we are struck by the fact that no one has ever come nearer to the first step in its solution than did Aristotle when he said that the whole problem of moral education reduces itself to this: to "get the boy to love the good and hate the evil." This pedagogical maxim is sound because based on a correct psychological analysis. Herbart made a similar analysis when he said that the immediate assurance of moral conduct is found in a "many-sided interest." His "interests" are simply the loves and hates of Aristotle. Where modern psychologists like Wundt, James, Dewey and Baldwin refer us to our primal instincts and impulses as the ultimate springs of conduct they give no new light nor greater aid. Very few psychological or even educational writers have devoted themselves to the study of this problem. Foremost among the few that have seriously attacked it is Dr. Bagley, who, in his "Educational Values," treats the sources of conduct from the biological point of view, terming them conduct-"controls," and separating them into inherited and acquired controls, including under the latter head: habits, knowledge, ideals, tastes and prejudices, attitudes and perspectives.

Anyone interested in this problem cannot help being duly thankful for every new contribution in this field. Yet, with

fullest appreciation of the indisputable value of Dr. Bagley's work as a whole, we can hardly consider his treatment of the problem adequate. In the first place, it involves a peculiarity of psychological analysis that is not entirely free from objections. For instance, the consideration of "perspectives" as distinctive controls is hardly justifiable, for they are secured on the basis of certain habits and knowledge-contents; hence, the latter are the real controls, and not the former. In the same way his "attitudes" are not disparate from ideals or tastes and prejudices. Historically the term attitude has been used in at least three different senses: first, to designate a mental state, or experience; second, the mental disposition which serves as the direct source of such mental state, or experience; third, the objective behavior or action brought about as a response to, or as a reaction of, the mental content. Nowhere does Dr. Bagley tell us in which sense of the term he wishes to use it. As a matter of fact he uses it in all three senses. Where he suggests that attitudes are what the Germans call *Bewusstseinslagen,* he overlooks the fact that this German term designates a state of consciousness rather than the potential or dispositional source of such a state; for right in that connection he quotes from Dr. Judd to the effect that "each individual has his attitudes toward his acquaintance" and "that these attitudes have a stability and sanction which no single impression and no single disastrous result of applying the attitude can overcome," not seeming to recognize the fact that Dr. Judd uses the term in the second sense—something very different from a *Bewusstseinslage.* Generally he uses the term in the third sense, designating thereby the objective reaction which is the response to the mental state; and here the attitude is not a conduct-control, but conduct itself.

But even if the psychological analysis could be accepted *in toto,* the question might well be raised whether this analysis is any more serviceable for practical purposes than the older one that would speak merely of our interests, our likes and dislikes. My own observation of students in their attempts to secure a mastery of the problem leads me to think that they struggle less with the latter simpler way; and furthermore,

Peter Sandiford

that this latter way is less apt to lead to error in procedure than is the more complicated scheme of Dr. Bagley's. I am convinced that the most satisfactory way of getting our students to secure a working knowledge of the sources of conduct is to attack the problem from the standpoint of the psychology of values, to get them to look upon behavior as springing from our sense of values, our likes and dislikes.

But, whichever view of the matter we take, the real difficulty is still unsolved. As regards the science, or theory, of the matter it is of course incontrovertibly true that to solve the problem of moral education it needs but to develop with Aristotle the proper "loves" and "hates," with Herbart the proper "interests," and with Bagley the proper "controls." But when the teacher, practically engaged in the work of applying these scientific principles, asks: "*How* am I to get the boy to love the good and hate the evil?" "*How* am I to develop those interests?" "*How* am I to secure those various controls?" she meets with a Sphinx-like silence on the part of all her advisers. It is true, Aristotle tells her that we become just by doing just deeds, that is to say, we learn to love justice by practicing justice; Herbart tells her that his interests are developed on the basis of "complete thought-masses;" Bagley is perhaps even less specific than Aristotle and Herbart when it comes to the formulation of clearly-defined principles for guidance.

Now it is right at his point that educational theory and practice must necessarily break down unless supported by a better psychological analysis than is available at the present time. Certainly educational psychology ought to be able to illumine the problem with a stronger and a brighter light. Having been convinced for years that it is right at this point that we ought to help out those that are to do the actual work of educating the rising generation, I have tried to formulate a few working principles on the basis of all the aid that I could get from a great variety of sources, and yet, in spite of diligent and painstaking application, the result is rather meagre and disappointing. Every voluntary act is prompted by a regard for some object. But regard for any other object than self is secured only on the basis of some sort of identification

of the self with the object. Where such identification with the object is pleasurable or agreeable, it develops a liking for the object, other things equal; where it is painful or disagreeable, it develops a dislike. Where the identification comes about in the form of knowledge about or acquaintance with the object, for instance, it develops a liking for the object, if the knowledge gained has been pleasurable, but a dislike if painful, other things equal. In the same way, appreciated benefits of any kind, material or otherwise, obtained or expected, create or enhance a liking, while injury or harm, received or expected, arouse dislike. Lastly, and most important perhaps of all, the more we do for the object, the more we render service to it, the more we do in its cause, other things equal, the greater our liking for it, while injuries done to it or opposition given it, will only create a new dislike or intensify an old one.

These principles, crude as they are, and involving certain logical and psychological difficulties as they do, yet serve an important practical purpose: young students of educational problems can comprehend them and apply them in such a way that in their teaching and in the general supervision of school activities they make their appeal to those forces that will assure more desirable conduct in their pupils. Yet there is urgent need of clearing up the many psychological difficulties involved in the problem, so as to make practical procedure at the same time more reliable and more efficient. It is hardly fair to throw the responsibility for the matter on those of us who are teaching in the normal schools. Our duties are so manifold, and the demands on us so varied that even given the ability to make such an investigation, we could not do it for lack of time and of energy. And so I hope that the time is near when the academic psychologist will be willing to renounce for once the claims of pure science and give practical assistance to those in urgent need of it. Or are we to conclude with James, with Muensterberg, and others that psychology can render no real service to pedagogy? I for one am not ready to accept such a view, and am eagerly waiting for the publication of Prof. Thorndike's lectures on the "Springs of Conduct," and hope that other psychologists will consent to devote a little serious attention to this important problem.

BINET-SIMON TESTS AT THE GEORGE JUNIOR REPUBLIC.

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Cornell University.

Communicated by G. M. Whipple.

(*Studies from the Cornell Educational Laboratory, No. 15.*)

Purpose of the Investigation.

Recent work with the Binet-Simon tests has demonstrated that a considerable percentage of delinquents are below normal in mentality, and many institutions devoted to corrective treatment have found it worth while for this reason to supplement the ordinary physical examination by the use of the Binet and other forms of psychological tests.

The George Junior Republic, at Freeville, N. Y., is an institution too well known to our readers to need description here, but it may be pointed out that the general plan of work for the boys and girls entrusted to its care has always presupposed the presence in the 'citizens' of ordinary intelligence, or at least of a grade of mental ability above that characteristic of any form of feeble-mindedness. The aim of the Republic is to duplicate in miniature the economic, civic and social life of a real democracy. The one hundred and fifty or more boys and girls, in their work on the farm, in the printing office, laundry, bakery or carpenter shop, earn all they possess and gain, as their motto reads, "Nothing without Labor." Add to this that systematic school instruction is given to all the members of the community and that all the rules and regulations of their daily life are made and enforced by the citizens themselves, and it will be seen that the Republic is no place for the mentally in-

competent. And experience has, in fact, shown it to be inadvisable to admit children less than twelve years of age.[1]

Now it would seem a fair presumption that the aim of the Republic—to make industrious, self-reliant, moral men and women of boys and girls who, though wayward, criminal or immoral, are still physically and mentally sound—cannot be met if the entrant be *mentally* less than twelve years of age, even though chronologically older, or at least if the disparity between his mental and his chronological age be sufficiently pronounced to indicate real deficiency or any considerable degree of retardation. The fact, then, that a few of the citizens at Freeville had failed to benefit as they should have by the remedial and educational agencies of the institution led Supt. Burch to request the Education Department of Cornell University to carry out tests of mental status upon these more troublesome cases.

In a series of half-day clinics held at Freeville, February to June, 1913, we applied Goddard's revision of the 1911 Binet-Simon tests to 20 boys and 6 girls. These 26 cases included not only the troublesome cases above mentioned, but also four newly admitted citizens, the citizen "president" of the Republic and a few other prominent citizens of undoubted ability, who were examined partly as a check upon the method and partly because the nature and purpose of the testing had in some way become generally known and had created an adverse sentiment against being tested—the report gained currency that any citizen who was invited to the clinic was *ipso facto* "a fool."

The Results.

The following data indicate clearly enough the outcome of the work, save that a word of explanation is perhaps called for with regard to the figures in the fourth column. These figures show the value of the "mental quotient" for all cases in which the mental age falls below 12 years. This quotient, which has recently been urged by Stern[2] as affording a more valuable in-

[1]While the coincidence may be accidental, it is of interest to note that a mentality of 12 years is generally conceded to mark the upper limit attained by high-grade defective children.

[2]Die psychologischen Methoden der Intelligenzprüfung. Leipzig, 1912. See especially pp. 55-ff.

An English translation of this volume will appear soon in the Educational Psychology Monographs.—*Editor.*

dex of deficiency than the customary statement of the absolute difference between chronological and mental age, is computed by dividing the mental by the chronological age, and thus affords an index of relative retardation. The quotients in the table have been multiplied by 100.

Case No.	Chronological Age.	Mental Age.	Mental Quotient.	Comments.
1	18	8.5	47.2	Moron or high-grade imbecile
2	19	11.5	60.6	Moron
3	15	11	73.4	Probably moron
4	15	11	73.4	Probably moron, needs glasses
5	18	14	....	Normal
6	13	12+	....	Normal, rather bright
11	17	10+	61.8	Moron, tested twice
12	16	10	62.5	Probably moron
13	17	10	58.8	Moron
14	15	11.5	76.6	Probably defective, lazy, needs glasses, narrow memory span
15	16	12+	....	Below average in intelligence, but not defective, needs glasses
16	15	12	....	Poor intellectual grasp, but probably not defective
17	17	12	....	Nervous, needs retesting, probably poor intelligence
18	17	15+	....	Normal, slow, persistent
19	18	13	....	Slow, but not defective
20	19	13	....	Tested under poor conditions, seemed bright
21	15	13	....	Not defective, but weak in some respects, needs glasses
22	17	15+	....	Normal
23	16	14	....	Normal
24	14	13	....	Normal
25	14	12+	....	Normal, weak in use of language
26	15	14+	....	Normal
27	16	15+	....	Above normal, exceptionally good in higher ages
28	16	13	....	Normal though short of his chronological age, bright
29	18	15+	....	Normal
30	20	14+	....	Normal

It will be seen that of the six girls tested (Nos. 1 to 6) the first two are defectives and the next two probably defectives. Nos. 1 and 2 should be removed from the Republic and Nos. 3 and 4 should be retested for signs of improvement. Of the 20 boys tested (Nos. 11-30), three (Nos. 11, 12 and 13) rank as

morons and should be removed from the Republic. The next four cases give evidence of inferior intelligence, though not clearly mentally defective so far as the examination went. They are borderline cases and need further study. The remaining thirteen boys show normal intelligence.

The mental quotient, as might perhaps be expected, is of very dubious value when applied to cases whose chronological age is much over 12. In only two cases (Nos. 3 and 4) do our quotients accord with Stern's tentative ascription of the values—.62-71 to imbeciles, .71-77 to morons, .80-84 to doubtfully defective, and .90 + to normals. For groups like the one under investigation it is not so much the amount of retardation, whether absolute or relative, as it is the absolute mental age, that is significant.

Difficulties in the Use of the Tests.

The chief obstacle in the application of the Binet-Simon tests to the citizens of the George Junior Republic is the very obvious one of the insufficiency of the tests for ages above 12. Our subjects ranged from 13 to 20 years; most of them were 15 years or over in chronological age. The lack of any tests for mental ages 13 and 14 made it difficult to apply any statistical rules to the evaluation of ages above 11, because of the too small number of tests upon which the valuation had to be based and because of the obscurity of the method to be used with even the limited number of tests at our command. Take, in illustration, Case 20. This boy passed all the tests for age 10, which therefore becomes the base for the computation of his status. He also passed four tests of the next year, three of the year after, three of age 15 and three of the adult tests. Under strict interpretation he would seemingly score $10 + 13/5 = 12.6$. But the fact that he passed three of five tests for adults and the same number for fifteen-year examinees would seem to warrant a better standing. Or, to put the matter in another way, had there been tests for ages 13 and 14, it would seem probable that he would have passed at least five of those ten additional tests and this would have added a year to his standing.

Without wishing to place too much emphasis upon our opinion, we have the impression that the code test (XV, 3) is too difficult, and exacts too much time in proportion to the value to be obtained from it.

Our experience, short as it is, has also confirmed our belief that the Binet tests should be given only by those who have been trained in laboratory methods in psychology. It is difficult to see how an examiner without such training would be able to maintain standardized conditions and yet at the same time make such skillful adaptation of the details of method as to meet judiciously those variations that are constantly arising in the attitude and responses of the subjects under test.

Despite these and other minor difficulties, the tests have served a real purpose in the practical administration of the Freeville Republic, and it is planned that in the future no applicants for admission to citizenship will be received until their mental status has been scientifically determined.

COMMUNICATIONS AND DISCUSSIONS.

THE FOURTH INTERNATIONAL CONGRESS ON SCHOOL HYGIENE.

From Monday, August 25th, to Saturday, August 30th, the city of Buffalo was the Mecca of hundreds of superintendents, school medical inspectors, school nurses, teachers, health officers, college professors and numerous laymen who were concerned with the forward movement for the health of the child at school. In so far as attendance on the part of the general public, space in the newspapers and other secondary signs may be taken as criteria, this Congress accomplished at least one phase of its purpose, viz: the intensification in the popular consciousness of the notion that school and educational conditions during the plastic period are of decided importance for healthful physical and mental development and that there exists a sufficient body of facts and principles, some of them precise and scientific, some of them, to be sure, as yet ill-digested and perhaps inaccurate, to warrant a place for school hygiene as a special branch of sanitary science.

On the scientific side we can speak only of our own impressions. To a critical observer there seemed to be rather too much arm-chair opinion where hard-won facts would have been more welcome and too great readiness to flaunt personal opinion where objective demonstration would have been in order. Our general impression, reached with reluctance, was that school hygiene, though making progress, is still far from an exact discipline. There was certainly manifested at Buffalo a tendency on the part of practical men with only semi-scientific training, like physicians, school inspectors and administrators, to discuss at length topics like heating, ventilation, open-air schools, mental hygiene, mental tests, etc., in a manner which evinced more eagerness to arrive at a working hypothesis or perhaps even more eagerness to be heard in public than to make permanent contributions to the advancement of scientific knowledge. Doubtless this impression was developed in some part by the discussions which followed the presentation of the formal papers. In many sections the chairmen made no effort to hold the participants in these discussions to the time-limit announced, nor to the topics presumably

under discussion. Moreover, as is usual when discussions are thrown open to the public, those who spoke longest and oftenest frequently had the least to say.

The sessions were also sadly interfered with by the lack of proper seating facilities: there was nearly enough room, but much of it empty of chairs, while it was quite impossible for late-comers to make their way at all into the rooms when popular or well-known speakers were holding forth.

To mention specific papers in any short report of the Congress is well-nigh impossible, because there were so many from which to choose. The program comprised the bewildering number of 44 separate sessions, to say nothing of concurrent exhibitions, symposiums, receptions, excursions, conferences, and simultaneous meetings of other bodies with allied interests. The morning programs, for example, generally embraced six simultaneous sessions, while there were in all some 450 contributors to the general program and more than that number of papers.

Some idea of the scope of the Congress may be gained by an enumeration of several topics to which sessions were devoted. We may mention open-air schools, school buildings and their equipment, fatigue and nervousness in school children, instruction in hygiene, mouth hygiene, mental hygiene, the ventilation, heating and cleaning of school buildings, sex hygiene, medical inspection, play and athletics, crippled children, health and supervision of college and university students, the conservation of vision, school feeding, school illumination, tuberculosis among school children, school nurses and school clinics, and mental tests of school children.

Two of these sessions may be selected for brief comment. The first of these is the symposium on sex hygiene held at the Elmwood Music Hall. There were many who commented upon the serious interest displayed by the audience of 2500 people, who listened intently during a long afternoon to the addresses upon this topic. We think it is safe to say that ten years ago, perhaps even five years ago, such an audience could not have been gathered, or at least such a respectfully earnest audience could not have been gathered for the purpose that animated the one at Buffalo. This, of itself, shows that the public agitation for a better understanding of the problem has made headway. There was undoubtedly sympathy felt by the greater part of the audience for some sort of attempt to move forward and aban-

don the "policy of silence" in matters of sex instruction. The addresses, in particular that of Ex-President Eliot, were of remarkable caliber, even the antagonistic presentation of the representative of the Roman Catholics was notable as a bit of oratory, however sophistical one might have felt it to be as a bit of logical exposition.

Another session of interest to the readers of this magazine was that devoted to the Binet-Simon tests. The papers presented at this session were all quite technical. They showed among other things, a division of opinion as to the practicality of the scale, and especially as to its value in the hands of amateurs—a matter that was naturally somewhat disconcerting to many of those in the audience who would have preferred to have listened to a wholesale endorsement of the scale at the hands of the experts on the program. Indeed, one may raise the query whether there is not a certain measure of reason in the complaints of those who after the meeting privately expressed their sorrow at what seemed to them a hypercritical attitude toward the use of the scale by school administrators (the regular discussion was unfortunately brought to a sudden termination by the advent of a 'crank' who could not be induced to leave the platform). And, again, this session brought out a difference of opinion as to whether tests of the simpler mental processes were of practical benefit in the schools or whether tests of complex processes, like Binet's, were needed. Doubt was also cast on the accuracy of some of the recently published work upon the extent of feeble-mindedness in school systems, among delinquents, etc.

As is usual in such gatherings, most of the delegates profited more by the opportunity for personal exchange of ideas at informal meetings outside the regular sessions. One such meeting, especially, made headway in an attempt to settle certain important questions relating to the Binet-Simon tests. It is hoped to publish in this JOURNAL in the near future the substance of the conclusions reached.

In closing, a word of commendation should be said for the very elaborate and interesting scientific and commercial exhibit, and especially for the adjunct to the exhibit, prepared by Dr. Dresslar, and open to teachers especially interested in school hygiene, wherein the greater part of the contributions to the literature of school hygiene had been classified, annotated and displayed for examination.

G. M. W.

ABSTRACTS AND REVIEWS.

EDMUND BURKE HUEY, A.M., PH.D. *Backward and Feeble-Minded Children. Clinical Studies in the Psychology of Defectives, with a Syllabus for the Clinical Examination and Testing of Children.* Baltimore: Warwick & York, 1912. Pp. xiii, 221. $1.40.

The social surveys of the past ten years have begun to show us how serious is the problem of mental defect in modern civilization. In England and Wales it has been found that there is one mental defective of some sort to every 125 of the population, and it is probable that the percentage is just as high in this country. Moreover it would seem that the percentage of mental defect is increasing rather than diminishing. Some, it is true, claim that the increase is only apparent, that our censuses are now much more accurate and thus many who would have been overlooked before are now reported, that the dividing line between normality and mental defect is now more sharply drawn, and thus those who were formerly labeled "queer" are now called feeble-minded. But even after making allowance for all these contingencies others insist that there is an actual increase in the relative number of abnormal human beings. This increase has been accounted for on two grounds. On the one hand the increased pace of living, the strain after more money, more of the luxuries of life, more show and glitter, more rapid rate of accomplishment in all lines, keep us keyed up to a higher pitch of nervous tension, and any slight tendency to mental defect thus receives its full measure of development. Thousands of those who in a former generation would have lived out monotonous, humdrum lives like straws upon the placid bosom of a sheltered lake, are seized by the swift current of excitement and nervous strain, and dashed to pieces on the rocks of mental wreck. On the other hand the biologists tell us that the law of the survival of the fittest has been suspended by our sentimental protection of the weak, that the feeble-minded, owing to their inability to foresee results and check their animal impulses, propagate much more rapidly than the normal

population, and that gradually but surely their poison is infecting the whole body politic. If the latter interpretation adequately represents the facts, and many recent studies seem to confirm this view, the question "What shall be done with our feeble-minded?" becomes one of vital social import.

The first task in connection with the feeble-minded is obviously to find them, and as the author points out there is no place where they may be found more easily than in the public schools. We may say if we like that the schools should be for normal children, that the feeble-minded have no business in them, that they should be segregated and placed in separate institutions. The fact remains that they are in the public schools now and will continue to be in them for many a year, and it is incumbent upon school authorities to detect them, to remove them from the regular classes, and to give them such training as they can take and profit by.

In this task of the diagnosis and classification of mental defectives the present book will be of great assistance. The introductory chapter sets forth the need for the study of the feeble-minded, and the advantages offered for such study in the special institutions for the feeble-minded. The second chapter deals with classification and terminology, and in it the author adopts the usage of the American Association for the Study of the Feeble-Minded, according to which the term feeble-minded is applied to all degrees of mental arrest, and this large class includes the three sub-classes, idiots, imbeciles and morons. Those defectives whose mental development never exceeds that of a normal child of about two years are called idiots. If the defective's development is arrested between two and seven years he is called an imbecile, and if his intelligence is higher than this, but does not exceed that of a normal child of twelve, he is called a moron. In addition such descriptive terms as cretin, Mongolian, epileptic, etc., are found convenient.

In the third and fourth chapters, which constitute the body of the book, we have detailed clinical pictures of thirty-five high grade morons, or border-land cases. In these studies we have the general description of the subject, the results of the physical examination, the previous history and home conditions so far as they could be obtained, the mental age as determined by the Binet tests, and the results of other mental tests, as the cancellation test, story reproduction, story invention, orientation, similars, opposites, and the

Kent-Rosanoff association test. Chapter five deals with the tabulation of the data, and chapter six presents syllabus for the clinical examination of children. This syllabus is also published separately, and gives a complete account of the methods used in securing the data presented in the text. In addition the publishers issue the record blanks used by the author, including clinical reference cards, the Binet-Simon tests, home record and history, school report, a point scale of tests for intelligence, and directions for giving and scoring point scale tests. These record blanks are to be had at forty cents per dozen, and are a great convenience to those who engage upon the testing of children.

The book forms a valuable contribution to the technique of mental testing, and will be of great assistance to those who are engaged in the task of detecting and classifying backward and feeble-minded children. J. C. B.

The History of Modern Elementary Education. SAMUEL CHESTER PARKER. Boston: Ginn and Co., 1912. Pp. xxvi, 505.

This work aims to give an account of the history of modern elementary education, paying special attention to school practice in its relation to social conditions.

The first of the four parts into which the book is divided is devoted to the definition of the term "elementary education" and to a lucid and convincing account of the conditions which hindered the development of elementary vernacular schools during the Middle Ages.

The progressive secularization of the schools is selected, rather happily, we think, as the central theme about which are grouped the main facts of the history of elementary education from the Renaissance to the present. The second part of the work treats of the elementary schools on a religious basis, the third part treats of the partly secularized, and the fourth and concluding part of the completely secularized elementary schools.

Perhaps the chief merit of the book is a certain clearness and force of presentation due largely to a skilful selection and organization of material.

For the plan of the work as a whole the author acknowledges his indebtedness to Robinson's "History of Western Europe" and similar works. The essential features of the plan are: (1) The inten-

sive treatment of a limited field, (2) emphasis upon a few representative movements, institutions and individuals, and (3) the treatment of these in a concrete manner.

A striking feature of the book is the extent to which it exemplifies the application of the Pestalozzian, Herbartian and other educational principles which it describes. In the first place, it contains numerous illustrations of schools and school equipment as well as portraits of eminent intellectual leaders and educators, and photographic reproductions of pages from famous school texts. Secondly, a summarized statement of contents precedes each chapter and prepares the mind of the reader for the assimilation of the material to be presented. Frequent topical headings in black-faced type and italics assist to the same end. Finally, the author not infrequently turns aside from his subject to keep his reader informed as to his aims and as to the relation of the topic under discussion to those which have preceded it and to those which are to follow.

Another feature which adds to the value of the book is the number of instances in which errors of commission or of omission in earlier works on the subject are rectified. Let us take as an example the subject of the gild schools. Most histories of education have been inclined to ascribe the establishment and maintenance of these too exclusively to the craft and merchant gilds. Mr. Parker's book is one of the first to do justice to the work of the social and religious gilds. Another instance deserves, perhaps, special mention. The work of J. H. G. Heusinger, an educator and an original and forceful educational writer especially active in Germany during the Napoleonic period, has hitherto been strangely neglected by English and American writers on education. Not only was he one of the most progressive educational thinkers of the time, but in his emphasis upon the utilization of the play impulse and of handwork as means of education, in his recognition of the superior ability of women as educators of young children, and in other respects he anticipates not a few of the important features of Froebel's system. Mr. Parker's is perhaps the first American history of education to mention Heusinger and to point out Froebel's indebtedness to him. The story that a well thumbed and annotated copy of Heusinger's "On the Utilization of the Child's Impulses to Activity" was found in Froebel's library after his death is repeated by Mr. Parker and so positively as to suggest that he has more direct and

definite information than that contained, for instance, in Rissmann's Geschichte des Arbeitsunterrichts (p. 25, note).

The work abounds in quotations, but these are as a rule so apt and so cleverly introduced as to retard but little the flow of the narrative.

Less successful, it seems to the reviewer, has been the organization of the material in the latter half of the work.

Whatever merits the plan of making the secularization of the school the central theme may possess it presents difficulties which the author has been only partially successful in overcoming. It is likely to suggest that the process of secularization was more steady and continuous than it actually was. It creates a tendency to underestimate the influence upon education of the religious movements subsequent to the Protestant Reformation. It is this, perhaps, which accounts for the omission of any reference to the important work in elementary education of Francke and other pietists in Germany.

The chapter entitled Pestalozzian Industrial Education would be more complete did it lay more emphasis upon the *development* of the Swiss reformer's views as to the aim and method of manual and industrial education. The psychological arguments for hand training set forth by Pestalozzi in *How Gertrude Teaches Her Children* (chap. XIII) may well have exerted as marked an influence on Froebel as his views as to the economic importance of hand training did upon Fellenberg.

The book as a whole is an eminently successful attempt to convey to the reader in a clear and attractive manner the main facts of the history of modern elementary education. Wise selection and effective arrangement of material, clearness and directness of style and aptness of illustration combine to make it one of the most helpful books hitherto written on the subject.

L. F. ANDERSON.

School of Education, University of Illinois.

ANNA G. NOYES, B.Sc. *How I Kept My Baby Well.* Baltimore: Warwick & York, 1913. Pp. 193. $1.25.

This book is not a medical treatise on the care of infants, but it may be used with profit as a supplement to such a manual, and it goes far toward furnishing the data needed as a foundation for the

generalizations of medicine. Medical books usually deal with "the average baby," or present typical forms of diseased conditions. Such averages and type studies have their value, but it is the individual that we are concerned with in the task of raising healthy and vigorous members of the coming generation. The present book gives us a careful study of the development of an individual baby. It is, of course, not the first detailed study that has been made of a single baby. We have many records of individual children from Darwin and Preyer to Dearborn, but all of these are made from the standpoint of behavior and particularly the development of conscious control. The book under consideration is unique in that it contains a complete and detailed record of an individual baby for two years, taken solely from the point of view of health. And what is of more practical and vital importance in the development of an infant than health? It is indeed interesting to study the early reflexes, to watch them become modified into more or less skillfully controlled adjustments, to note the early manifestations of intelligence, to trace the course of speech activities, and to chronicle the feats of memory. But even the skilled specialist can modify these phases of development to only a slight degree, while health is fundamental to them all, and yet can be seriously disturbed by the least negligence. The carelessness and ignorance of mothers and even of many physicians in regard to the amount and kind of care that an infant should have makes it surprising that infant mortality does not reach even higher percentages than those we read about. Yet how can young mothers be anything but ignorant when they are taught all sorts of things from fashions to Sanskrit except the care and training of children? It is a curious anomaly that the work which is of the most vital importance to the welfare of the race is totally neglected in our provision for the education of girls. It is encouraging to note that a school of mothercraft has recently been opened in New York City, but its influence will necessarily be limited to a few. The need for instruction is general, and the place where it should be given is in the upper elementary grades and in the high school.

Even physicians have little exact knowledge of the finer details of infant health. There are no data available for scientific treatment. Hospital records give a picture of disease, but are of little value for the prevention of disease. We need a large number of just such detailed and careful records of individual children as this book pre-

sents. Only upon such a series of health studies as a basis will it be possible to construct a genuine science of infant health.

Space will not permit a discussion of the record in detail. The author gives a minute description of her observations during nine typical months, and summarizes the account for the remainder of the first twenty-five months of the child's life. The months selected for detailed treatment are the first and the twenty-fifth (which mark the beginning and the end of the study); "two of the most perfect months, the seventh and the twenty-first, the one before and the other after weaning; and a group of five months, each of which contained a particular problem, as follows: the second month, the problem of regurgitation, the sixth month, of overfeeding, the ninth and tenth months, of weaning and a cold, and the twenty-fourth month, that of teething."

The book is provided with a detailed index, which adds greatly to its usefulness as a work of reference, and is enriched by more than fifty photographs and thirty-seven charts. J. C. B.

HELEN C. PUTNAM, A.B., M.D. *School Janitors, Mothers and Health.* Easton, Pa.: American Academy of Medicine Press, 1913. Pp. 211.

This helpful little volume represents a revision and extension of papers previously published by Dr. Putnam in the *Child-Welfare Magazine,* the *Journal of the American Public Health Association* and the *Proceedings of the National Education Association.* It does not pretend to be a textbook in school hygiene, though it might serve well for required reading by students in normal schools and colleges; its primary mission is to arouse and encourage mothers of school children to take an active and intelligent interest in the sanitary and hygienic condition of schoolhouses, to convince mothers that they should and could bring about conditions of healthfulness inside the walls of the schoolroom as satisfactory in every whit as those they insist upon securing and maintaiuing in their own homes. To the reviewer this aim seems as important as it is laudable. With a few exceptions, perhaps most notably in the State of Texas, organizations of women have not risen to a full realization of the power for good they might wield in practical application of the fundamental principles of school hygiene.

The five chapters of the book deal with the prevention of school

fatigue, mothers' clubs and clean schoolhouses, the relation of the janitor to school health, the problem of janitor service and the training of janitors. These chapters are subdivided into topics which are assigned for consideration by women's clubs in the programs of a series of monthly meetings. Particularly commendable is the insistence on precision and care in the collection of data, and the intelligent use of instruments of precision in the study of actual schoolroom conditions. At the same time the personal and narrative tone of the whole book removes it from the danger of frightening away its prospective audience by any impression of coldly scientific didacticism. G. M. W.

THE
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The Journal is issuing a series of Monograph Supplements for the publication of more extensive researches in educational psychology. For details prospective contributors may apply to Guy Montrose Whipple, Cornell University, Ithaca, N. Y.

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EDITORIALS.

THE 'CASE METHOD' IN EDUCATIONAL PSYCHOLOGY.

The very general success of the 'case-method' of instruction in schools of law raises the question whether a modification of that method might not be valuable for classes of prospective teachers who have acquired a fairly comprehensive familiarity with the facts and principles of educational psychology. It would be impossible, of course, to force the analogy between the study of law and the study of education very far, because the principles of law have been derived by quite another method than those of psychology and the typical legal 'case' presents somewhat different aspects to the student than would the cases that might be brought before the student in education. Yet, there is at least the similarity that both would call for analysis of a concrete situation and the application to it of principles previously learned. What I have in mind is possibly better characterized as a kind of class-room clinic for the discussion of concrete problems arising in practise.

The following are samples of the 'cases' that I have in mind.

though I should expect in each case to give many more data than can be cited just here. (1) A young man in his second college year can not commit to memory without the greatest difficulty any material demanding verbatim reproduction. What are the theoretically possible sources of his trouble; how should his case be investigated; what suggestions can be given to assist him? (2) The father of a left-handed boy in the kindergarten is very anxious that the teacher should compel the use of the right hand. Should the teacher advise the attempt; if not, why not? (3) A parent asks at what age it is best for her child to begin the study of a foreign language. What is the proper answer and why? (4) Could a teacher in the third grade train her pupils to concentrate attention by the use of formal exercises with a revolving blackboard? (5) A child is suspected of being mentally defective. What method can be used to investigate his status? What symptoms would indicate real deficiency? What improvement may be expected from educational treatment? (6) A high-school principal would like to know what curriculum would afford the best all-round mental training. What subjects are to be suggested and what training value may be expected from each of them?

It would surely be not difficult to extend these samples and even to concoct a 'case-book' of ample dimensions. If the last two or three weeks or more of every course in educational psychology could be devoted to the discussion of such concrete problems, the dangers of barren verbalism from text-book study would, I believe, be largely overcome. G. M. W.

NEW COURTIS TESTS IN ARITHMETIC.

The growth of interest in mental tests and increasing use of them in school work constitute a most significant movement in modern education. Simple tests of attention, perception, association, memory, imagination and invention are coming into use more and more generally as indices of the original mental endowment of the child, while the Binet tests offer a graded series of complex, every-day tasks which have proved remarkably useful in making rough determinations of mental age. Owing to the fact, however, that the materials of most of these tests are greatly simplified and schematized, and that the subject matter and methods of attack are quite different from the ordinary work of the schools,

there is a justifiable skepticism as to their precise significance for teachers and superintendents. It is true that we need to know more about the elementary mental processes of the school child, but what is also needed, and what would be of much more direct advantage to the teacher, is a system of scientific tests in school subjects. The Courtis Standard Tests in Arithmetic marked an important step in this direction, and their use in the scientific investigation of educational conditions in New York, Boston, Detroit and other cities, and their employment by hundreds of teachers throughout the country for a more accurate determination of the arithmetical abilities of their pupils, indicate the high esteem in which they are already held. Extended work with these tests has convinced Mr. Courtis, however, that other and simpler arithmetical tests are needed,—tests that more nearly approximate the arithmetic work of the schools. Accordingly, he has devised a set of four tests, one for each of the fundamental operations, each containing twenty or more examples of the sort usually set at school, but so constructed as to include systematically all of the elementary combinations. The author denominates these tests Series B, Arithmetic, and speaks of them as follows:

"The work done with Series A has proved that the basic problem in education today is that of ministering adequately to individual needs. The first step toward this end is the formulation of definite objective standards. The standards derived from the use of Series A, however, are either complex or of questionable value, owing to the uncertainty of their meaning. This is particularly true of the reasoning tests in which mere ability to read is a large factor.

"Accordingly, Series B represents an attempt to secure definite, objective standards for each of the four operations with whole numbers,—addition, subtraction, multiplication, and division. On the basis of the knowledge gained from Series A, a test has been constructed for each operation to serve as a general measure of ability in that operation. The test in addition, for instance, consists entirely of addition examples, each three columns wide, each column nine figures long. The figures are so chosen that all the fundamental combinations are represented. The time allowance is eight minutes. The test as a whole and in its component parts is thus long enough to measure whether or not a child or class has learned (1) the fundamental combinations; (2) the mechanism of column addition; (3) to carry; (4) to bridge the attention spans; (5) to control the effects

of fatigue; (6) to work at the proper speed; and (7) with proper accuracy. When this test is standardized, it will be possible to set for each grade just the degree of skill in addition that is within the reach of the average child. So for the other operations.

"Series B is issued this year for the first time. It is believed that eventually it will entirely displace Series A except in the solution of certain problems, and that the standards obtained will have a permanent value. The labor of scoring and tabulating is simpler and the cost both in time and money less than for Series A. Its use is advised for beginners."

In order that these tests may have a fair trial in many parts of the country and that the results may be made known and norms constructed, the author offers them on the co-operative terms that proved so successful with Series A. The tests will be furnished at cost (about two cents per pupil) to school authorities who will agree to tabulate the results and return copies of the essential records to the central bureau. Further particulars may be learned on application to Courtis Standard Tests, Department of Co-operative Research, 82 Eliot Street, Detroit, Michigan.

J. C. B.

NOTES AND NEWS.

The city of Lyons, France, is organizing an International Urban Exhibition to extend from May 1 to November 1, 1914. At this exhibition all phases of city life in civilized countries will be represented, and in view of the importance of education in city life especial emphasis will be laid upon the portrayal of school conditions, including school buildings, furniture, materials of instruction, courses of study, methods of teaching, educational tests, and school hygiene. It is desired that "every nation should be represented by an exhibit which will give an accurate and complete notion of the efforts and cares it has devoted to its schools." Such an exhibition will be of great importance in impressing upon the public the value of educational activities not only from an intellectual but also from an industrial and commercial point of view. Those who are interested may obtain further information by applying to Professor Chabot, Hotel de Ville, Lyons.

The School of the Science of Education (Institute J. J. Rousseau), founded at Geneva, Switzerland, through the initiative of Professor Ed. Claparède, and directed by Mr. Pierre Bovet, finished its first year of existence in July. Among its students were representatives of Germany, Armenia, Belgium, Brazil, Spain, United States, Greece, Palestine, Holland, Poland, Portugal, Roumania and Russia. A characteristic feature of the work of the school is the adoption of the seminar conference type of instruction, so that each student carries on his own individual work under the personal supervision of his instructors. This gives rise to an intimate family relationship between students and professors which is of the greatest value. The course of study will be forwarded on application to the Director, at 5 Place de la Taconnerie, Geneva.

At the Conference Exhibit on Mental Hygiene, held at Pittsburgh in April of this year, the following addresses, among others, were of interest to educational psychologists: "Feeble-mindedness and School Children," by E. Bosworth McCready; "Rational Industrial Education of the Feeble-minded," by C. B. Conneley; "The Functions of the Psychological Clinic," by J. E. W. Wallin; "Sex Hygiene in Connection with Mental Health," by Elizabeth Martin, and "Segre-

gation of the Feeble-minded—Protection of the State," by Stanley H. Howe.

The department of clinical psychology of the University of Pittsburgh has issued an interesting bulletin setting forth the aims of the work and the courses offered in 1913-1914. Emphasis is laid upon the proportion of retarded and defective children in the schools, and the necessity for special training on the part of those who attempt to direct their education. Courses are offered in clinical psychology, in the study, care and education of mentally exceptional children, and in psycho-educational pathology and educational therapeutics. Perhaps the most important phase of the work is the dispensary clinic and practicum, in which the student comes into direct contact with defective children, and has practice in examination and diagnosis under expert supervision.

The International Faculty of Paidology at Brussels, under the direction of Dr. I. Ioteyko, has established a new quarterly journal, *Le Paedologium,* to serve as an organ of publication for the activities of the Faculty in the scientific study of the child. It is the avowed aim of the Faculty to contribute to the development of paidology "as a real science in the strict sense of the term," and to this end it will issue three sets of publications: (1) *Le Paedologium,* for the publication of short articles and notes of current interest, (2) *La Revue Psychologique,* which has already made an enviable reputation in the world of scientific literature, and which will contain longer and more technical articles, and (3) *Travaux de la Faculté Internationale de Pédologie de Bruxelles,* a series of monographs on paidological topics. Of these monographs *Ambidextrie,* by V. Kipiani, has already appeared, and the following are announced: *Les Défenses Psychiques: La Douleur, La Fatigue,* a contribution to the study of the education of the emotions, by Dr. I. Ioteyko, and *Rapport entre l'Acuité Sensorielle et le Développement de l'Intelligence,* by Mme. Lipska Librach. The subscription price of *Le Paedologium* is five francs, and the address is 69 Rue de la Culture, Brussels.

In accordance with the recent action of the House of Delegates the educational authorities of Prussia have authorized the establishment at the University of Halle of a chair in pedagogy. This will be the first professorship in pedagogy to be established in any Prussian university. A pedagogical seminar has been organized and placed

in charge of Dr. Alfred Rausch, Director of the Franckesche Latin School in Halle. Dr. Rausch will give instruction in the theory and practice of education.

A fund of $50,000 to be expended in the next four years on experimental studies in ventilation problems has been placed at the disposal of the New York Association for Improving the Condition of the Poor by Mrs. Elizabeth Milbank Anderson. The commission which will have charge of these experiments will include among others Professor F. S. Lee, physiologist, and Professor E. L. Thorndike, psychologist, of Columbia University.

The German edition of Professor Whipple's *Manual of Mental and Physical Tests* is announced by Otto Nemnich, of Leipzig, to appear under the title *Leitfaden für Intelligenzprüfungen,* as Volume 9 of the series *Die Pädagogik der Gegenwart.* The translation and adaptation of the German edition is being done by Professor Meumann, of Hamburg. The second American edition, rewritten and enlarged, is now in preparation.

At the meeting of the National Education Association in Salt Lake City Dr. Joseph Swain, president of Swarthmore College, was elected president, and Dr. Robert J. Aley, president of the University of Maine, was chosen president of the National Council of Education.

Dr. Edward O. Sisson, professor of education in Reed College and previously head of the department of education in the University of Washington, has been appointed Commissioner of Education for the State of Idaho.—*Science.*

The Board of Regents of New York State has appointed Dr. John H. Finley, president of the College of the City of New York, as State Commissioner of Education to succeed the late Dr. Andrew S. Draper.

CURRENT PERIODICALS.

(In this section only such articles will be noticed as bear directly or indirectly upon the interests of this Journal.)

SCHOOL SCIENCE AND MATHEMATICS. Vol. XIII, No. 1, January, 1913. W. L. Eikenberry. *The Statistical Investigation of School Grades.* 27-36. The author calls attention to the tremendous mass of material in school grades, which only requires tabulation to throw much light upon individual mental abilities. The chief objection to the use of this material is the fact that teachers vary widely in their standards of marking, but the author believes that if grades are taken from a sufficiently large number of teachers these variations will cancel each other. Each teacher is urged to make a statistical tabulation of his own grading.

No. 2, February, 1913. W. C. Bagley. *Vocational Guidance and the Teacher of Science.* 89-97. The two outstanding problems in vocational guidance are (1) discovery of the specific abilities of the individual, and (2) acquainting the individual with the various occupations open to him, with the type of work they demand, the wages they pay, the preparation required, the conditions of advancement in them, and their fascinations and dangers. In order to solve these problems correctly the advocates of vocational guidance need to be cautious in their presuppositions. The correlation between interest and ability is an assumption which needs testing. Interest depends largely upon the superficial aspects of a vocation, or upon "fashion," and may have little connection with native ability. The assumption that natural abilities are highly specialized needs scrutiny. In the absence of definite knowledge it is safer to assume that native endowment supplies a nervous system which can be trained to do any one of a large number of things acceptably well.

Thos. J. McCormack. *On the Psychology of Errors in Elementary Mathematics.* 121-132, 211-219. Errors arise in three ways: (1) Through imperfect formation of the concept, rule, or definition involved; (2) through imperfect embedment of the concept in the system of mental associates; (3) through a hitch in the unravelment or motor expression of the concept in appropriate physical form. The article offers an interesting application of the psychology of space to the teaching of geometry and algebra.

No. 3, March, 1913. Worrallo Whitney. *Science in the High Schools, an Investigation.* 183-196. A comparative study of curricula in botany, showing the gradual evolution of the teaching of high school botany away from the servile imitation of college botany characteristic of a few years ago, to a more independent position. The present tendency is toward a flexible course, in which the purely scientific development of the subject is subordinated to the development of the pupil's interest in botany.

A. Duncan Yocum. *A First Step in Inductive Research into the*

most Effective Methods of Teaching Mathematics. 197-210. A stimulating survey of the fields of geometry, algebra, and arithmetic from the point of view of problems for the experimental investigation of the teaching of these subjects. Over one hundred problems are mentioned and briefly discussed. The author makes no reference to previous work in this field.

No. 4, April, 1913. ELLIOT R. DOWNING. *A Study of an Attempt at Uniformity in Grading Students.* 290-293. An investigation showed that the twelve members of a school faculty had widely different standards of grading. The faculty passed legislation requiring that grades should approximate the probability curve. The results for four terms show a decided increase in uniformity.

No. 6, June, 1913. W. C. RUEDIGER. *Realness in Science Teaching.* 461-468. A study of the reports of sixty-five college students on their recollections of the way in which high school science was taught. Field trips, excursions and out-door work were decidedly uncommon. There was much laboratory work, but little conception by the student of its significance.

ZEITSCHRIFT FUER ANGEWANDTE PSYCHOLOGIE. Vol. VII, Nos. 2 and 3, March, 1913. RICHARD MUELLER-FREIENFELS. *Thought Types and Imagination Types.* 121-184. This analysis of mental types is based not on experimental investigations, but on a study of the histories of great men, particularly the eminent men of art and science. In this respect it resembles the work that the celebrated physical chemist Wilhelm Ostwald has done in his "Grosse Männer" and other writings. The author distinguishes two sorts of observers: (1) the "individualist," who is cognizant of only the specific object before him, and (2) the "type observer," who is aware of the individual object chiefly as a representative of a type or class. He believes that the first sort is met with more frequently among workers in the descriptive sciences (physics, chemistry, history, etc.), and the second among mathematicians and philosophers. From another point of view the static worker is distinguished from the dynamic worker (the latter is characteristic of creative art), and with reference to the self the subjective is contrasted with the objective thinker. Each of these types is illustrated with many examples drawn from history, and the attempt is made to establish certain correlations between the types.

ANATHON AALL. *The Psychology of Narrative Reproduction.* 185-210. A comparison of the fidelity of immediate reproduction of a story with reproduction after a lapse of two days. In immediate reproduction there are two types of attack, (1) the enumerative type, in which the attention is directed to a kind of catalogue of the details, and (2) the narrative, in which the individual details are subordinated, fused or modified in the interests of a well balanced story. The article presents a detailed discussion of the percentage of error in each of twenty points of the story. Later reproduction furnishes

much evidence of the effects of the first reproduction, in that errors made in the first are apt to be repeated in the later rendering. On the other hand there is a supplementary memory activity, in that points omitted in the first reproduction frequently appear in the second. The second reproductions of the men were more condensed and more sharply defined, those of the women were more detailed and gave evidence of greater tenacity. The men lost ten per cent. more than the women in two days.

Max Hentschel. *Two Experimental Investigations on Children in the Realm of Tone Psychology. Part II. Judgment of Small Intervals.* 211-222. The average of correct judgments for the prime at 800 vibrations per second was, boys, 94 per cent., girls, 90 per cent., with a total range of from 81 per cent. to 97 per cent. Children from 10 to 14 years of age gave 25 per cent. correct judgments of direction to a difference of $\pm$ 5 vibrations about 800 per second. At this difference 51.5 per cent. were judgments of equality. The percentage of correct answers at $\pm$ 10 vibrations was boys 55 per cent., girls 48 per cent.; at $\pm$ 20 vibrations, boys 72 per cent., girls 65 per cent.; and at $\pm$ 50 vibrations, boys 88 per cent., girls 84 per cent.

G. Fr. Muth. *Experiments in Ornamentation with Children from Six to Ten Years of Age. Part II. The Parallel Development of Three Children.* 223-271. The first part of this discussion appeared in Vol. VI, No. 1. The three children under consideration were provided with sheets of paper of uniform size on which concentric circles of a given diameter had been drawn. These were called plates, and the children were called upon to decorate them as beautifully as possible. Several illustrations of ornamental shields were shown them as samples, but no further instruction or directions were given. The spontaneous development of their inventiveness in ornamentation during the years mentioned is described in detail.

Nos. 4 and 5, June, 1913. G. Heymans and H. J. T. W. Brugmans. *Intelligence Tests with Students.* 317-331. An experimental contribution to the analysis of complex intellectual activities into simpler mental processes. The authors used six tests of memory, six of imagination, six of perceptual and motor activities, three of concentration, and five of reasoning, and calculated the coefficients of correlation. The highest positive correlation was between imagination and reasoning (+ .94), while the correlations of perceptual and motor activities with other functions were largely negative and thus indicate a certain antagonism between those functions.

Adolf Koch. *An Experimental Investigation of the Process of Abstraction in Elementary School Children.* 332-391. The first twenty pages of this article, which is a product of Külpe's laboratory, give a detailed summary of previous work on abstraction. For the experiments nine boys were so selected from each of the eight grades that each group contained three bright, three average, and

three dull pupils. With each of these 72 pupils ten experiments, each of twenty minutes duration, were performed. The task was to find among a large number of geometrical figures the one like the figure shown on a screen, *i. e.*, to make the abstraction of likeness. The author concludes that ability in this exercise is more a function of intelligence than of age or of school acquisition.

ERNEST BLOCH AND HEDWIG LIPPA. *The Binet-Simon Tests of Intelligence* (1908) *applied to Feeble-Minded Children.* 397-409. An account of the application of the Binet tests to 71 pupils of a special school for retarded children.

ZEITSCHRIFT FUER PSYCHOLOGIE. Vol. LXIV, No. 1, February, 1913. PAULA MEYER. *On the Reproduction of Memorized Figures and their Spatial Relationship by Children and Adults.* 34-91. This investigation from the laboratory of G. E. Müller, Göttingen, contains a detailed analysis of the reproduction of simple geometrical figures. The method lends itself well to use with children as young as seven years. Children make more errors of position than adults, they tend to reduce rather than to enlarge the figures, and they show a considerable tendency to mirror drawing. Larger figures are retained better than smaller ones, unless the small ones are intensified by a colored boundary line.

PEDAGOGICAL SEMINARY. Vol. XX, No. 2, June, 1913. GOSHICHI YAMADA. *A Study of Questioning.* 129-186. A valuable survey of previous experimental work on questioning is followed by an account of the author's own experiments on 134 pupils of the seventh and eighth grades. Passages in geographies that the pupils had studied were reviewed for ten minutes, the pupils were asked to write a spontaneous report on the selection, and were then required to answer specific questions on it. In some cases the specific questions were asked before the report was called for. The results were similar to those obtained by Stern, Lipman, and others, in that the examination gave a greater range in quantity, but stood lower in quality than the free report. The influence of a preceding examination upon a succeeding report is very slight. The mental attitude of the pupils toward the two is quite different. The article concludes with interesting quotations from answers to a questionnaire on English teaching, and a pedagogical discussion of the findings of the investigation.

FRANK E. HOWARD. *Psychological Differences between Children and Adults.* 236-253. An examination of the literature of recent experimental psychology for significant points of difference between children and adults in memory, ideation, attention, suggestion and reasoning. The results show the inadequacy of our exact knowledge on any of these topics. The retentiveness of children seems slightly greater than that of adults, but in every other respect adults are superior. There is great need for norms of performance at different ages and in different types of activity.

PUBLICATIONS RECEIVED.

(Notice in this section does not preclude a more extended review.)

JOHN DOUGLAS ADAM. *Letters of a Father and Son during College Days.* New York: Fleming H. Revell, 1913. Pp. 207. $1.00 net.

This is a series of solemn reflections on the weighty problems of life expressed in epistolary form. They are rather sermonettes than letters. It is to be feared that both father and son are altogether too pious to represent the views of any real persons on actual situations.

Agricultural Instruction in Secondary Schools. Bulletin No. 522. Washington: Bureau of Education, 1913. Pp. 51.

Papers read at the third annual meeting of the American Association for the Advancement of Agricultural Education, Atlanta, November 12, 1912.

Annotated Bibliography of Medical Inspection and Health Supervision of School Children in the United States for the Years 1909-1912. Bulletin No. 524. Washington: Bureau of Education, 1913. Pp. 135.

A valuable compilation. The annotations are exceptionally ample, and present a clear idea of the essential findings.

A Trade School for Girls. A Preliminary Investigation in a Typical Manufacturing City, Worcester, Mass. Bulletin No. 525. Washington: Bureau of Education, 1913. Pp. 59.

An investigation to determine the type of school that would best meet the vocational needs of female wage earners. Conducted by the research department of the Women's Educational and Industrial Union of Boston.

FRANK P. BACHMAN. *Overage and the Method of Determining Overage.* New York: Committee on School Inquiry, 1913. Pp. 52.

A discussion of the overage conditions of New York City schools, together with a criticism of the present methods of securing and presenting overage data.

JESSIE H. BANCROFT. *The Posture of School Children.* New York: The Macmillan Company, 1913. Pp. xii, 327. $1.50 net.

This book was prepared by the assistant director of physical training of the New York City public schools with special reference to home hygiene and to new efficiency methods for school training.

"These methods are largely an application of some of the principles of the new school of efficiency engineers, or scientific management experts,—principles that are working a revolution in industrial circles, and may do equally important service in education if the way can be found for applying them." The book contains a twelve-page bibliography.

HOLMES BECKWITH. *German Industrial Education and its Lessons for the United States.* Bulletin No. 529. Washington: Bureau of Education, 1913. Pp. 154.

A valuable comparative study of conditions in Germany and America, and of the industrial training in each country. In his final chapter the author suggests some important lessons that we might learn from Germany.

Bibliography of Industrial, Vocational, and Trade Education. Bulletin No. 532. Washington: Bureau of Education, 1913. Pp. 92.

The greater number of the references are liberally annotated.

E. C. BRANSON. *The Georgia Club at the State Normal School, Athens, Georgia, for the Study of Rural Sociology.* Bulletin No. 533. Washington: Bureau of Education, 1913. Pp. 41.

An interesting method of obtaining economic, industrial, and educational surveys in rural districts.

BENJAMIN GRIFFITH BRAWLEY, A.M. *A Short History of the American Negro.* New York: The Macmillan Company, 1913. Pp. xvi, 247. $1.25 net.

The author sketches the history of the slave trade, the attitude toward the negro during the revolutionary and early national period, the development of the slavery issue, the civil war, and the attainments of negroes since the abolition of slavery. The tone of the book is optimistic.

FRANCES WILLISTON BURKS AND JESSE D. BURKS. *Health and the Schools.* New York: D. Appleton & Co., 1913. Pp. xix. $1.50 net.

Under the guise of a series of conferences between a school superintendent, a member of the school board, a self-made business man, his wife, a social worker, and a physician the authors discuss some of the current attempts to bring the health of the child to the attention of school authorities and of the general public. Part I discusses the breakdown of the school in its health program, part II demonstrates the opportunity of the school for promoting health, part III ad-

vances a program of child hygiene, and part IV is entitled "Socialized Health: A Forecast."

WILLIAM TIMOTHY CALL. *A New Method in Multiplication and Division.* Hawthorne, N. J.: C. M. Potterdon, 1913. Pp. 67. $0.50.

"The method here shown is the outcome of my efforts to simplify the process of multiplying and dividing numbers. The chief purpose in this endeavor was to indulge my own curiosity as to the possibility of doing such a thing." On the basis of five as a pivotal number the author has worked out a system of multiplying and dividing large numbers which is interesting, and which might prove economical.

LUCIEN CELLÉRIER. *Littérature criminelle.* Reprinted from the Anneé Pédagogique, 1913. Pp. 38.

A discussion of the psychological effects of trashy literature and the portrayal of criminal acts in moving pictures, and a survey of the means of protection against such influences.

S. A. COURTIS. *Better Teaching in Arithmetic.* Reprinted from the Proceedings of the Harvard Teachers' Association, 1913. Pp. 30-59.

This stimulating address is illustrative of the new type of pedagogical appeal. "If we are to have better teaching, the spirit that must permeate our whole profession—from administrative officers down to the humblest teacher in the simplest rural school—must be a new sense of the necessity for a closer study of the child, a greater desire humbly to learn Nature's laws. For only as Nurture and Nature act in unison are perfect results attained." "We say the teacher should consider the individual child, but we make no provision in time, methods, or course of study for a practical exhibition of such consideration. My thesis is that we must practice what we preach; that the teaching of children is a far more complex task than even the wisest of our leaders have realized; that we must begin over again and evolve new methods, new courses of study, new ideals of education generally, and that all must be based upon the central idea of determining and ministering adequately to individual needs."

G. V. N. DEARBORN. *Notes on School-Life Hygiene.* Reprinted from the Pedagogical Seminary, Vol. 20, June, 1913. 209-221.

The author emphasizes the need of the child for abundant sleep, outdoor air, reduction of fatigue, proper food, exercise and play, freedom from care and worry, and information regarding sexual matters.

F. B. Dresslar, Ph.D. *School Hygiene.* New York: The Macmillan Company, 1913. Pp. xi, 369. $1.25 net.

To be reviewed.

Hermann Ebbinghaus. *Memory. A Contribution to Experimental Psychology.* Translated from the German by Henry A. Ruger and Clara E. Busenius. Educational Reprints, No. 3. New York: Teachers College, Columbia University, 1913. Pp. viii, 123. $1.00.

The publication of Ebbinghaus' monograph in 1885 marked the beginning of the experimental study of memory—a field which has now grown to such proportions as to exceed perhaps any other topic in the output of psychological investigations. The original has long been out of print. The work is valuable from the standpoint both of method and of results, and the translators have rendered American students a valuable service in making it accessible in its complete form.

Edward Eggleston. *The Ultimate Solution of the American Negro Problem.* Boston: R. G. Badger, 1913. Pp. 285. $1.50 net.

The author states that this is an attempt to put the negro question on a strictly scientific footing. A survey of the early history of man, of the habits of primitive man, and of the native African peoples convinces him that the negro is of an unalterable mental and moral inferiority, and is destined to be eliminated. A brief history of negro slavery leads up to an elaborate consideration of negro vital statistics, negro crime, and negro education, all of which point to the steady elimination of the negro in this country.

Expressions on Education by American Statesmen and Publicists. Bulletin No. 538. Washington: Bureau of Education, 1913. Pp. 39.

Almost all the leaders in American affairs have expressed themselves strongly in favor of education, and it will be convenient and useful to have some of these expressions collected in a single volume.

Fifteenth International Congress on Hygiene and Demography, Washington, 1912. Bulletin No. 528. Washington: Bureau of Education, 1913. Pp. 57.

Part I of this report is a description and discussion of the numerous exhibits at the congress. This was prepared by Dr. Fletcher B. Dresslar. Part II contains a digest of some of the more important papers.

KARL GROOS. *Das Seelenleben des Kindes.* Fourth edition, revised and enlarged. Berlin: Reuther & Reichard, 1913. Pp. 335. M. 4.80. Geb. M. 5.70.

The popularity of this work is attested by the rapidity with which new editions are called for. While the general tone of the work is theoretical rather than experimental, there is a noticeable tendency in the later editions to lay greater stress on the results of experimental investigations. No mention is made of the recent extensive studies in mental tests.

COSMO HAMILTON. *A Plea for the Younger Generation.* New York: Geo. H. Doran Co., 1913. Pp. 74. $0.75 net.

An impassioned protest against the usurpation by the school of those aspects of education which, according to the author, are the prerogatives and duties of the home. In particular the author condemns the godlessness of modern education, and urges a return to "the fear of God as the beginning of wisdom." The subject of sex enlightenment receives special consideration as the peculiar topic which should be left to parental instruction.

W. H. HECK. *A Second Study of Mental Fatigue in Relation to the Daily School Program.* Reprinted from the Psychological Clinic, Vol. 7, No. 2, April 15, 1913. 29-34.

A repetition in Lynchburg, Va., of an experiment recently tried by the author on pupils of the New York City schools. The conclusions of the New York investigation are confirmed by the present study, *viz.*, that the fatigue is so slight as to be almost negligible in a hygienic school environment.

A. C. HILL. *Prison Schools.* Bulletin No. 537. Washington: Bureau of Education, 1913. Pp. 47.

Every thoughtful man must admit that society's treatment of its criminals is a marvel of waste and stupidity. With all of our conservation of national resources we are only beginning to appreciate the importance of the conservation of man. The idea of revenge and enslavement for infraction of law is an instinctive and primitive attitude that still holds sway. It is only recently that the physical welfare of the condemned began to receive attention, while the idea of their mental and moral improvement still seems utopian. The present monograph gives an interesting account of the work done in the New York State prison schools, and argues for an extension of that work.

WALTER S. HUNTER, PH.D. *The Delayed Reaction in Animals and Children.* Behavior Monographs, Vol. 2, No. 1. Serial No. 6, 1913. Pp. v, 86. $1.15.

Education has already derived valuable concepts and points of view from experimental studies of animal behavior. It is noteworthy and entirely laudable that the experimentalists are beginning to attack the more complex forms of behavior, and that they are making their work comparative in the broader sense by testing children and adults under the same conditions as those under which animals are studied. The present monograph is a comparative study of the representative factor in the behavior of animals and children. Since the aim of education is to control action, and since the ideational control of action rests upon the representation of previous experience, it is obvious that such a study is vitally related to the educative process. The subjects used in the experiments were white rats, dogs, raccoons and five children from two and one-half to eight years of age. All of the subjects learned to respond correctly to the situation after the stimulus had been removed. The amount of delay was lowest for the rats and highest for the older children. The author distinguishes three types of learning: 1. Trial and error alone. Here belongs the learning of the cats and dogs. 2. Trial and error controlled to some extent by a representation of strictly sensory content, or "sensory thought." The behavior of the raccoons and of the youngest child was of this type. 3. In addition to trial and error and sensory thought the behavior of the older children showed "the possibility of directing reactions by images."

Illiteracy in the United States and an Experiment for its Elimination. Bulletin No. 530. Washington: Bureau of Education, 1913. Pp. 38.

A compilation of statistics and diagrams showing the illiteracy of the different states, and an account of an experiment in Rowan County, Ky., to teach all the people, even adults 90 years old, to read and write.

I. IOTEYKO. *Premier Congres International de Pédologie tenu a Bruxelles,* 12-18 *Aout,* 1911. *Vol. I. Comptes Rendus des Seances, Communications. Pp.* 488. *Vol. II. Rapports.* Pp. 600. Both volumes, 20 francs.

These two thick volumes give an excellent picture of the status of the new science of paidology, particularly as represented in Western Europe. Among the important discussions are a series of papers on the teaching of paidology, studies of anthropometry, scientific studies of aptitudes and capacities, reports on coeducation, psychoanalysis with children, report experiments, children's definitions, the value of manual training, etc. The reports should be accessible to every student of child nature.

F. B. Jevons. *Personality.* New York: G. P. Putnam's Sons, 1913. Pp. vii, 172. $1.00 net.

Everyone believes in his own existence and that he knows something about himself. But when he asks himself just what he knows about his own personality, he begins to find himself in difficulty and in so far as he persists in this inquiry he becomes a philosopher. The four chapters of this book deal with personality and impersonality, psychology and personality, personality and change, and personality and individuality. Much of the book is devoted to a discussion of Bergson's views.

Georg Kerschensteiner. *A Comparison of Public Education in Germany and in the United States.* Bulletin No. 534. Washington: Bureau of Education, 1913. Pp. 15.

The author, who recently spent several months in this country studying American schools at first hand, and who is one of the foremost German school men, points out the superior thoroughness of the German secondary school, but at the same time laments the weaknesses of the German schools in technical education.

Edwin J. Kyle and A. Caswell Ellis. *Fundamentals of Farming and Farm Life.* New York: Charles Scribner's Sons, 1912. Pp. xxxii, 557.

In this day of emphasis on the teaching of agriculture in the schools it is advisable not only for teachers of agriculture but for educators in general to keep in touch with the literature of the subject. The present text contains an abundance of practical information on the scientific aspects of farming, is delightfully written, and stimulates the reader to continue his studies in more technical treatises. It is one of the most valuable books of its kind.

Sir Ray Lankester. *Science from an Easy Chair.* Second Series. New York: Henry Holt & Co., 1913. Pp. xiii, 412. $2.00 net.

In this country being a scientific man is usually synonymous with being dull, heavy, ponderous, incomprehensible. In England there is a tradition that the scientist should not only delve deeply into his subject, but that he should have a considerable amount of information on all sorts of things, and that he should be able to touch upon a wide range of subjects lightly, deftly, entertainingly. In this volume the eminent English zoologist has brought together a large number of papers, written with charming grace, yet permeated with the scientific attitude of mind, which he has contributed from time to time to the columns of the Daily Telegraph. The subjects range all the way from kissing and cookery, through tadpoles and fern seed, to glaciers and prehistoric animals.

HELEN MACMURCHY. *Feeble-Minded in Ontario. Seventh Report, for the Year* 1912. Toronto: L. K. Cameron, 1913. Pp. 52.

The present report chronicles a great awakening of interest in Canada in the problems of the feeble-minded. In place of the old indifference, there are discussions, mass meetings, letters to the press, and newspaper editorials calling attention to local conditions and demanding that something be done. Dr. MacMurchy's reports constitute an effective means for focussing the attention of the public upon this important social question.

FRANK M. MCMURRY. *Elementary School Standards.* Yonkers, N. Y.: The World Book Co., 1913. Pp. ix, 218.

This is the second volume of the School Efficiency Series issued under the editorship of Professor Paul H. Hanus. Like the previous volume by Professor Moore, this book had its origin in the report of the Hanus Commission to the Committee on School Inquiry of New York City. In the present volume Professor McMurry makes a constructive criticism of the quality of the teaching, the course of study, and the supervision by the principals in the New York elementary schools. He found it necessary to formulate standards of value for judging the work of the elementary schools, and a careful study of these standards will be profitable for every educator.

GEORGE FOOT MOORE. *The Literature of the Old Testament.* New York: Henry Holt & Co., 1913. Pp. vi, 251. $0.50 net.

A popular account of the old testament from the standpoint of the results of higher criticism.

MAX OFFNER. *Das Gedächtnis. Die Ergebnisse der experimentellen Psychologie und ihre Anwendung in Unterricht und Erziehung.* Third edition, enlarged and partially rewritten. Berlin: Reuther und Reichard, 1913. Pp. xii, 312. M. 20. Geb. M. 5.00.

This is unquestionably the most complete and systematic account of the phenomena of memory that is available in psychological literature. The titles of the sections are: 1. The position of memory in the whole field of mental life. 2. Sensation and idea. 3. The concept of disposition. 4. Association. 5. The strength of dispositions. 6. The awakening of dispositions and their effects (reproduction). 7. Individual and sex differences in memory. 8. The dependence of memory upon age. Capacity for improvement. The law of decay. 9. Memory and intelligence. The value of remembering and forgetting. It is remarkable that no mention is made of recent American experiments on the subject.

ELSIE CLEWS PARSONS, PH.D. *The Old-Fashioned Woman: Primitive Fancies about the Sex.* New York: G. P. Putnam's Sons, 1913. Pp. viii, 373. $1.50 net.

A curious and fragmentary, yet withal very interesting, collection of ideas, comments and customs relating to the status of woman. Customs of Bushrangers and South Africans, of Fijis and Dyaks, are brought into close juxtaposition with ideas of Pall Mall and Fifth Avenue, and all are used in half mocking fashion to show the absurdities in the traditional conception of the sphere of woman.

W. PETERS. *Die Beziehungen der Psychologie zur Medizin und die Vorbildung der Mediziner.* Würzburg: Curt Kabitzsch Verlag, 1913. Pp. 33. M. 1.20.

An argument for the inclusion of psychology as a required subject in the course of study for all medical students. Although the physician comes into more intimate relations with all sorts and conditions of mental make-up than any other professional man, medical training leaves him not only ignorant of modern scientific psychology, but oftentimes arrogant and scornful toward it. This cripples his efficiency, for the physician should treat not merely the body but the whole organism.

Proceedings of the Department of Superintendence, Philadelphia, Pa., February 24-28, 1913. National Education Association, 1913. Pp. 227. Twenty-five cents.

Among the most valuable papers reported here are the discussions of uniformity standards, by Finnegon and McMurry; Developing the co-operation and initiative of teachers, by Judd; School credit for outside work, by Meek and Alderman; Reports on economy of time, by Wilson, Judd, Coffman and Ayres; Scientific management, by Hanus, Spaulding and Yocum; and Efficiency of teachers, by Davidson and Blewett.

E. E. RALL. *An Experiment with the Courtis Tests in Arithmetic.* Reprinted from School Review Monographs, February 1913. 36-44.

An effort was made to determine by means of the Courtis Tests the improvement in reasoning ability resulting from special attention to "problem" work with fifth-grade pupils for one-half school year, and the possibility of correcting deficiencies so that individual records would be brought up to the "standard" scores. The practiced group showed a far greater gain than the unpracticed group, but the individual records showed an increase rather than a decrease in lack of uniformity.

Report of the Commissioner of Education for the Year Ended June 30, 1912. 2 Vols. Washington: Bureau of Education, 1913. Pp. xxvi, 647 and xviii, 669.

The present report fully maintains the reputation of the department for valuable compilations of statistics, and constructive surveys of current educational movements. Of especial interest are the resumes of current criticisms of the public schools, the activities in city school systems, the progress in vocational education, and the description of typical health teaching agencies.

C. H. Robison and F. B. Jenks. *Agricultural Instruction in High Schools.* Bulletin No. 513. Washington: Bureau of Education, 1913. Pp. 80.

Interesting topics in this bulletin are the provisions for the higher training of teachers of agriculture, relations of secondary to elementary agriculture, and the difficulties of instruction in the subject.

Leroy Walter Sackett, Ph.D. *The Canada Porcupine: A Study of the Learning Process.* Vol. 2, No. 2, Serial No. 7, 1913. Pp. iii, 84. $1.15.

The first fifteen pages of this monograph are devoted to a biological and naturalistic study of the animal under investigation. The experimental section describes reactions to puzzle-box situations, color and brightness discrimination, and learning the Hampton Court Maze. The animals readily learn to manipulate a puzzle-box with four locks in series, show moderate ability in brightness discrimination, but no color discrimination, and learn to run the maze very quickly. Their retention is remarkably good where kinaesthetic factors are involved.

E. Mather Sill, M.D. *The Child, its Care, Diet, and Common Ills.* New York: Henry Holt and Co., 1913. Pp. viii, 207. $1.00 net.

A series of simple, sensible talks on the feeding of infants and particularly on the treatment of the common diseases of childhood. It is a scientific work, yet plain enough to be comprehended by all. It constitutes a good supplement to Holt's Care and Feeding of Children.

Gerald Birney Smith. *Social Idealism and the Changing Theology.* New York: The Macmillan Co., 1913. Pp. xxii, 251. $1.25 net.

It is interesting to note that the professor of theology in one of our leading divinity schools admits that there is need for a reconstruction of Christian theology in our day. On the basis of "Social Idealism" he attempts to indicate the lines of this reconstruction.

It is safe to assume, however, that the author's position is not sufficiently radical to satisfy the vast majority of scientific thinkers, who are desirous of a religion to which they can give full assent without stultifying their own conceptions of truth.

ALVA WALKER STAMPER, PH.D. *A Text Book on the Teaching of Arithmetic.* New York: The American Book Co., 1913. Pp. 296. $1.00.

"In planning the present book, the author has kept in mind three aspects of the teacher's preparation: the need of the perspective gained through a comprehension of the larger teaching problems concerned in the teaching of arithmetic, the need of a clear insight into the content of arithmetic, and the need of an understanding of arithmetic method."

Types of Schools for Young Children. London: The Froebel Society, 1913. Pp. 16. 2d.

This little pamphlet contains two addresses, one by Miss Esther E. Lawrence on *Free Kindergartens,* in which she institutes a comparison between the Montessori work in Rome and the work done by the free kindergartens in London, and the second by Miss Rose Solomon on *An Infant School,* in which a detailed comparison of the Montessori course of study is made with that of the Jews' Infant School, Whitechapel.

J. E. W. WALLIN. *Clinical Psychology: What it is and what it is not.* Reprinted from Science, June 13, 1913. 895-902.

The author is at pains to distinguish clinical psychology from psychopathology, from neurology, from general medicine, from pediatrics, and from introspective, educational, or experimental psychology, and insists that "the assumption that any psychologist or educationist is qualified to do successful psycho-clinical work after learning how to administer a few mental tests, is preposterous and fraught with the gravest consequences."

R. S. WOODWORTH. *The Care of the Body.* New York: The Macmillan Company, 1912. Pp. viii, 359. $1.50 net.

A book on personal hygiene, "intended chiefly for the young man" and "founded on the belief that an intelligent man, without technical knowledge of medicine, and without excessive attention to the care of his health, can still do much to keep himself in good condition." Its chapters deal with the chief physiological functions, circulation, respiration, digestion, elimination, etc., and with important hygienic problems like work, rest, recreation, indulgences, diet, etc. The pages devoted to alcohol and tobacco furnish a sane and straightforward presentation that writers of temperance physiologies would do well to imitate.

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GENERAL INTELLIGENCE OR "SCHOOL BRIGHTNESS."

COLIN A. SCOTT,
Boston Normal School.

The problem of "general intelligence" is one which for some time has engaged the attention of differential psychologists. At first the assumption seems to have been that intelligence is some central ability which comes into function in every mental operation, and that if a person has a certain degree of intelligence in one direction, and if allowance is made for practice, experience, and acquired interest, he will be found to have about the same degree of intelligence in other directions. If this were true it would follow that a test, and a single test at that, might be found which would approximately eliminate practice, experience and interest, and thus serve as a measure for the central ability itself.

As experimental work proceeded, a great deal of skepticism arose as to the existence of any such central ability, or at least as to its significance as a markedly propotent factor in a given individual's intellectual performance. The hope of finding a single suitable test was given up and a combination of tests designed to measure different sides or kinds of intellectual performance, was sought for. These need not correlate with one another, but taken as a whole should correspond with

other indications or estimates of intelligence, such as age, or the opinion of people sufficiently acquainted with the individuals measured. In the case of children the opinion of teachers or class standing has usually been taken as a standard of comparison.

The "Binet tests" give us an example of such combined or resultant tests, but these are without significance for adults or even for children beyond thirteen or fourteen. They are also probably without much significance as a prophecy of future intellectual capacity in adult life, and must be regarded as indicating nothing more than a certain degree of maturity. As is well known, the approach to maturity presents many fluctuations, and children may pass and repass one another at various points in their development without justifying any conclusion as to their permanent intellectual power. The wide limit of three years' retardation required by the Binet scale as an indication of intellectual arrest is probably not too great for even approximate security.

The Binet scale, moreover, relies on tests which have no connection with intelligence in adult life. Rote memory, for example, has been shown to increase with age until about fourteen or fifteen, and after that to remain stationary. It gives an indication, therefore, of psychological age and in the case of children will give positive correlations with other tests involving age or maturity of intelligence. With adults, however, repeated investigations (including this one by the present writer) have shown no clear positive correlations with other measures of intelligence. It might seem from this that at one stage of growth an ability might be taken as an indication of a general power to produce intellectually, while at another age it could play no such role. If, however, one measured the size of the foot in children or the solidification of the epiphyses as has been done by Rotch, a correlation would likewise be found with age, and with general intellectual capacity as dependent on age. Size of feet or solidification of epiphyses might be as reliable indications of psychological age as rote memory. There is, however, no proof that any of them have a causal or contributive relation to intelligence. A superior rote memory at a given age, however useful as an

indication of maturity, cannot therefore be regarded as a reliable promise for the future, as far as intelligence is concerned.

It is possible, and even probable, that no combination of tests will ever be found that will reveal and measure with sufficient certainty the varying degrees of intelligence of adults of different social positions, different occupations, different conditions of health and temperaments, and different moral and emotional characteristics. Differentiation due to the working of these various factors must make profound changes, not perhaps in the formal intellectual ability, if such exists, but in the direction of attending, perceiving, grasping, associating, assimilating, conceiving, comparing, judging and thinking and whatever else may be distinguished as purely intellectual functions. How, for example, can a person who works mainly in words and their meaning be compared intellectually with one who works mainly in terms of material adjustments, whether of an artistic or of a scientific character? The best we could hope to do would be to arrive at separate scales adapted to the various stages of each different line of accomplishment. How high any point in one may be as compared with the corresponding point in another it would be impossible to say.

If these considerations are justified, it is only at that stage of life when growth is practically over (degree of maturity being thus excluded), and before differentiation has set in to any marked degree, that we should expect to find tests that would reasonably correspond to other estimates of intelligence. The ninety-four pupils of the entering class of the Boston City Normal School fulfil these conditions to a very great extent. They have been selected by agencies and subjected to influences which would tend to make those who enter much alike. They are all about the same age. Those of poor health are excluded. They have all had practically the same four years' high school course. They have passed the same entrance examinations. They dress alike and social prejudice exists against much variety. They are largely of the same race and social position. A large number of them, probably over half, judging from a previous inquiry made in Chicago,

have the same ambition to be teachers and desire personally, apart from home pressure, to prepare themselves for that position. The leveling influences of school and society have worked upon them to an extent probably not to be found in many other classes in the community.

And yet, of course, differences, including intellectual differences, appear among them, although the school environment puts a premium upon a particular kind rather than upon a variety of kinds of intellectual attainment. One of the factors here is the marking system which gives to those standing at the head of the list formed by the standings in all the subjects for the three years course, the first opportunity in obtaining a position. There is, accordingly, a strenuous struggle for marks rather than for a natural development, a condition which tends to prevent differentiation and to reduce intellectual performance to a single type. However regrettable this may be, it is probably better than the giving of appointments by personal or political pull.

The conditions described make it feasible to inquire as to the nature of the intellectual functions, which under these conditions give the impression to others of general intelligence or "brightness," and to seek for tests which will measure this ability. The result of this will not give us a measure of general intelligence that will be applicable to fields of activity other than the field of this school or one like it. It ought, however, (1) to manifest the type of intellectual functions which the organization of a school as a whole calls into play and thus indicate something of its efficiency; and (2) to measure the varying degrees of this intellectual function among the pupils in such a way as to show it free from association with aspects of character and effort such as social attractiveness, perseverance, industriousness or ambition, and independent of the struggle for marks.

The tests arrived at were selected from a number of tests made throughout the course of the year, and these were compared with judgments made by fellow pupils and by teachers on each individual as to her "general intelligence" or "brightness." These latter were made after an acquaintanceship of at least six months. The class is arranged in sections

so that sixteen or seventeen pupils are in one section and, as these all take the same subjects, each individual pupil is exceptionally well acquainted with the other pupils of that section as far as their work in school is concerned. This acquaintanceship includes not only observation in class but experience with them outside of class, in some cases previous experience in high school and in a few cases experience at home. Each pupil was asked to rank her comrades according to the impression they had made upon her as to their "brightness" from whatever sources she had gained this impression. In cases where differences were difficult to decide the individuals were to be grouped as equal. Remarks were to be placed opposite the names of those ranked, indicating the kind and source of the impression recorded. It was promised that the list so provided would be kept absolutely confidential as far as the pupils were concerned, and each was cautioned against communicating with others or inquiring as to ranking in regard to other pupils. The purpose of the ranking was pointed out to the pupils and it was seen that an average from the combined lists would give us a standard of comparison which would throw some light on the tests we had been making throughout the year. The proposal was entered into by the class with interest and willingness and, although the statement was clearly and emphatically made that, if any individual did not wish to make a list, she would be excused without question, there was no one who did not pass one in.

It is the impression of the present writer that these lists were prepared with a great deal of care and discrimination. This was shown by the remarks, and by various events which occurred. One of these will indicate what is meant. In one section, (Section 1) there are two sisters, one of whom is placed by the class average at the top. Her sister who is older, also judges her in this position. The elder sister is placed by the class average as fifth and this is also where the younger sister places her.

The accompanying table (Table I) gives the ranking in this same section and shows the general average with the probable errors. The line at the bottom gives the correlations of the judgments of each observer with the rank list obtained by

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	Total.	Av.	P. E.	P. E. m.	Position.
A		3	1	1½	1	1	3½	1	2½	2	1	1½	8	6½	4	8	2	47.5	2.97	1.61	.40	1
B	1½		3½	5	3	2	3½	2½	2½	2	4	3½	1½	1	5	7	4	50.5	3.16	1.20	.30	2
C	1½	5		1½	4	6	3½	2½	5½	7	2	1½	1½	5	3	6	1	56.5	3.53	1.33	.32	3
D	5½	2	3½		2	5	3½		5½	4½	7	5	13	2	1	4	3	71.5	4.47	1.53	.38	4
E	5½	1	2	3		3½	3½	5	7½	6	3	3½	13	6½	2	5	8½	78.5	4.90	1.73	.43	5
F	3½	5	14	7	5		3½	5	2½	2	10	11	4	3½	6	2	5½	82.5	5.14	1.99	.49	6
G	3½	5	13	4	6	3½		5	2½	4½	6	9	13	3½	7	1	5½	92	5.75	2.23	.55	7
H	7½	7	5	6	8	9	8		7½	9	5	8	5½	10	8	11	8½	123	7.75	1.08	.27	8
I	7½	9	12	13	7	7	10	12		8	9	10	3	9	9	3	8½	137	8.50	1.67	.42	9
J	10	10	9½	12	10	13½	8	9½	10		8	6	13	12	13	9	8½	152	9.50	1.31	.32	10
K	10	11½	6½	8½	11	15	14	9½	10	14		12	13	9	15	15	13	172	10.75	1.99	.49	11½
L	10	13	6½	12	14	8	11½	9½	10	11	11		8	11	11	14	13	173.5	10.84	1.40	.35	11½
M	13	14	9½	12	9	11	15	14½	13	10	15	13½		10	10	11	13	197	12.31	1.39	.35	14
N	13	8	9½	8½	14	12	8	9½	13	12½	14	7	13		14	11	13	180	11.25	1.75	.44	13
O	15	11½	15½	12	12	10	13	14½	13	15	13	15	5½	13½		13	13	205	12.81	1.39	.35	15
P	13	15	9½	15½	14	13½	11½	14½	15½	12½	12	13½	8	9	12		13	212	13.25	1.42	.35	16
Q	16	16	15½	15½	16	16	16	14½	15½	16	16	15½	15½	15	16	16		248	15.50	.03	.008	17
		1	1.4	2.8	1.87	1.19	1.19	1.75	1.19	1.45	1.56	1.62	1.75	4.04	2.22	1.71	3.12	1.43				
										Av. Dev. from Class Av.												
	r =	.96	.92	.65	.89	.94	.94	.90	.94	.92	.90	.88	.80	.80	.80	.88	.67	.91	Av. r = .84.				
										Correlations.												

TABLE I.—The letters stand for individuals. The vertical columns under each letter are the positions given to the rest by the individual represented by that letter.

averaging the judgments of all. The same kind of table was prepared for each of the six sections into which the class is divided.

The probable errors here follow quite a different order from that found by J. McKeen Cattell in his "Statistical Study of American Men of Science," 2nd ed. Professor Cattell found that the probable errors increased as the lower end of the list was reached, and he assumes that this was due mainly (page 549) to real differences between the men judged and not to "less knowledge of those whose work is less important." It would seem from the present data that when the individuals judged are equally well known no more difference of judgment is found at the bottom than at the top of the list. This obtains, however, as far as the whole list is concerned, under the condition that the whole number judged are given and not selected from a number twice as large, as in the Cattell investigation. The lower part, however, of the upper half of the present list shows no increase in probable error and here, except for the smaller number, the conditions are the same as in the Cattell inquiry.

It will be noticed that the individual at the bottom of the list has an extraordinary small probable error. The remarks, however, indicated some lack of acquaintanceship on the part of the observers with this pupil. The low probable error, instead of indicating certainty, under these conditions indicates some abnormal or unusual social condition. When this was discovered, investigation was made as to the home conditions for study on the part of this pupil and it was found that they were of a strongly inhibitory character. This prevented her from doing her best and, along with the fact that this pupil was of foreign birth, tended to isolate her and practically prevent her from having any appreciator among her classmates.

After these estimates were all in and the results tabulated, the pupils were asked to say confidentially where they would place themselves in the list if they had been asked to do this. They were told that if they did not care to pass this in they did not need to. To take one section as an example—that already represented in Table I, fourteen responded. One was absent and one of the others was judged by her mates to be

at the foot of the list and the third one very near it. The correlation between the self-made estimates and the estimates made by the others was by the Pearson rank correlation formula (used throughout this investigation,)+.96. This is as high a correlation as any of the individual correlations shown in the lower line of Table I. It would seem that individuals are able to judge themselves as well as others are able to judge them.

Table II is a similar table giving the judgments of the teachers. It will be noticed that while the average positions are not far away from the average positions in Table I (a correlation of .84), the probable errors are much greater. This is to be accounted for by the fact that the teachers are with the pupils less than one-sixth of the time that the pupils spend with one another, that probably the pupils are more keenly alive to a moderately bright hit made by a fellow pupil in the game of class work than are the teachers, and finally that the teacher looks at the pupil from a special point of view conditioned by the subject taught, while the pupils see one another in all subjects as well as outside of class. Because the pupils' judgments are a better index of general, as distinguished from special intelligence, these have been followed rather than the teachers' judgments in the final correlations.

The correlations of individual teachers with the teachers' average list show a considerable range, and the average of all comes no higher than .65. This may very well be due to the subject rather than to any marked difference in excellence of judgment. To throw some light on this, the teacher represented by W in this table was asked, and was kind enough to take the trouble to see, what kind of a list she could make with the sections she did not teach, but where she had a ten minutes' interview with each pupil separately. As a result of this her correlation with the average judgment of the pupils was +.54, while in the class she taught given in Table I, her correlation with the pupils' judgments was +.39. It is interesting to note that the average correlation of the teachers' judgments with one another is not far from that already found by Waite (in Pearson's magazine Biometrika, Vol VIII, p 92), who reports a correlation of +.50 for two different teach-

ers in the high school and +.66 for two judgments of the same teacher made nine months apart.

As to the value of the average position found in either table it would seem that the probable error of the average is too fine a measure to indicate certainty of position. The deviations are not due to chance to any extent, but to the ability and to the opportunity to appreciate different sides of a given personality. The probable error of the individual judgments (representing almost the majority of the judgments) is probably a safer guide to follow as to the certainty of the positions. In Table I the range of the individual probable errors would not place the most of pupils more than one place and a half (av, = 1.52) above or below the position shown by the average of all.

It will be noticed that the correlations of the brightest pupils with the class average are higher than are those of the less bright. It would seem that if an election could succeed in selecting the brightest, the opinion of all could be approximated closely enough for practical purposes, and this would afford an interesting comment on representative government. To see what results an election would give, three of the sections were asked to name by ballot a committee of three whom they could best trust to judge as to the ability of the other pupils. In one section the highest vote fell upon the same three persons previously selected as brightest, in another section they were numbers, 1, 3 and 4—in the third section numbers, 2, 5, and 9.

As already indicated it is not claimed that the average position shown in these tables is a complete measure of general intelligence. The experiences on which the estimates are based are too special. Some pupils probably give a better impression of their brightness than others, not because they are really brighter, but because they take the trouble required, or because they have natural social advantages. There may also be a great deal of special brightness in a particular line, either in the subject of study or in the wit and humor of daily contact outside of the class which, although recognized by the observers, is balanced off in their estimates by the lack of brightness or production observed in other lines. In real

life, however, or life outside of the school, specialization begins to count and a natural humorist, for example, may get a great reputation who would have little facility for the all round activities of the school. The term "general intelligence" or "brightness" in this investigation was always interpreted by the observers to mean the quality of the average intellectual output in all directions coming under their notice. There may very likely be directions in which those standing at the head of the list would show a great deal of facility and vice versa for those at the foot. Admitting, however, these restrictions it must be recognized that the lists show something—and that this is along the line of intelligence. What we prefer to call this is "school brightness" or more closely the brightness required in this particular school.

The problem then arises as to what are the essential features of this ability and whether there are individuals who have about the same intellectual capacities as those at the top, but who do not use them in the life of the school. Tests which correlate to a high degree with the judgments obtained would contribute to the solution of both of these problems. If the mass of the pupils have about the same position in the test that they have in the judgments, it is evident that these tests will serve to analyze the abilities involved, while those who are exceptional and who stand much higher in the tests than the position given them by the average of judgment can be regarded with some degree of probability as having a considerable part of the same ability which those have who stand higher than they in the judgment-lists. This fact, if known to them, may become useful in encouraging them either to make more effort or to find and remove some habit or timidity which stands in the way of their recognized success.

The tests that were tried out in comparison with these estimates were, rote memory, progress in reading upside down for ten minutes a day for ten days, tone discrimination, acquisition of ideas in reading from the printed page, retention of ideas for a week, range of information, two completion tests, and quickness in crossing out a's and t's. Rote Memory and reading upside down were found to have practically no correlation with the estimates or judgments. Tone dis-

crimination had a considerable correlation in some sections but very low in others. These tests were set aside and the remainder of the tests of the above test were taken to form an average. The records in each test were arranged in a frequency table and the percentage standing in the table taken as the final record.

	U	V	W	X	Y	Z	Total.	Av.	P. E.	Position.
A	1	15	14	3	4½	3	40.5	6.5	4.3	6
B	5	3	4	5½	9	6	32.5	5.4	1.2	4
C	9	1	5	12½	1	3	31.5	5.2	2.9	3
D	7	3	6	3	4½	7	30.5	5.0	1.3	2
E	2	12½	9	3	9	3	38.5	6.4	3.1	6
F	4	5	1	7½	13	15	38.5	6.4	2.6	6
G	3	12½	2	1	9	1	28.5	4.7	3.3	1
H	11	12½	8	5½	4½	9½	46.5	7.0	3.7	8
I	6	3	16	7½	13	15	60.5	10.0	3.8	11
J	10	7	10	9	4½	9½	51	8.5	1.9	9
K	13	16½	15	12½	15	11	83	13.8	2.4	16
L	12	16½	13	12½	2	13½	69.5	11.0	2.7	13
M	14	9	7	12½	13	9½	65	10.8	1.9	12
N	15	6	3	12½	7	12	55.5	9.2	3.3	10
O	8	12½	17	12½	15	16	81	13.5	2.1	14½
P	16	9	12	16	15	13½	81.5	13.6	2.9	14½
Q	17	9	11	17	17	17	88	14.6	2.6	17
r =	.71	.41	.55	.81	.60	.86	Av. r = .65			

TABLE II—The columns under U, V, W, X, Y, Z are the teachers estimates, of the same individuals as in Table I.

The test for acquisition of ideas was the reading of the paragraph supplied by Stoelting Co. called the Old Dutch Homestead. This was reproduced on paper immediately after reading or studying for three minutes. Ninety-seven pupils took this test. It contains 91 ideas or details. The average performance was 49.5 ideas with an A. D. of 9.2. The test for retention was the same paragraph, and there was no expectation on the part of the pupils that they would be asked to reproduce it a second time, and precautions were taken to ensure and to verify this absence of expectation. Four sections or 66 pupils gave an average of 43 ideas with an A. D. of 8.5. One section of 16 pupils gave the second reproduction ten days after the first learning, and had an average of 42 ideas with an A. D. of 9, practically the same as for the ten day period. One other section of 16 pupils did not give the second reproduction until the end of three weeks. In this case the average was 36, A. D. 6.6.

The test for range of information used was Whipple's list

of 100 words (published by Stoelting). The number of words defined was the standard taken. These definitions were written out by the pupils, who were told and made to understand by illustrations that they must define the word by putting what it represented in its class and distinguishing it from any other object in that class. All the definitions were gone over by the present writer and those not meeting this criterion were excluded. This treatment gave, with 98 pupils, a skew curve of distribution with the mode at 10 (correct definitions) and the average at 12. The A. D. was 3.

In the crossing out of a's and t's the pupils worked each with the same copy of editorial material in a newspaper for 9 minutes. The time was taken to find the time of simple reaction involved in this work by making similar strokes on a piece of paper, and the time per stroke calculated. This was subtracted from the total and the differences taken as the time of perception for a's and t's. The average of this time of perception for 92 pupils was 1.09 secs., A. D. .17 secs.

The two completion tests used were "Where the dandelions went" and "The strength of the Eagle," blanks supplied by Stoelting Co., Chicago. The two completion tests were added separately into the average (thus loading the value for this test).

The completion test thus forms the principal member of the series, and the correlation with the estimates was higher here than in the case of the other tests. This was due partly to an improved method of scoring. As everyone knows, one of the difficulties of the completion test is the fact that the gaps are usually counted as equal in value, while the fact is that they present a considerable range in difficulty. The procedure adopted was to count only those difficulties which on reading the papers had given some one of the 96 pupils an opportunity to commit some stupidity. The variations in filling in, which still made sense and were not contradictory to previous parts of the passage, were not scored as wrong. Those gaps which, say 50% of the pupils had failed to negotiate, were scored as twice as difficult as those which only 25% of the pupils failed to pass, and so on with the rest of the gaps. It was found that this method of scoring, as com-

pared with scoring equally every gap filled, raised the correlations between the completion tests and the estimates of the pupils from +.45 to +.56.

The accompanying chart shows in one section the comparative standing of each pupil in the estimates of her classmates and in the test. The black columns indicate the estimates, the shaded columns the tests. The correlation in this section between the two is +.83.

In the section whose table is given on page — the correlation is +.75. These correlations are so high that they could be slipped in among the correlations of judgments with the average (given along the lower line in Table I), and although not as high as those of the best judges, they are better than those of the worst. The other sections had average correlations of +.79, +.74, +.61, +.49. These with the two already given (+.83, +.75) give an average of +.70 for the whole of the 86 pupils who had missed none of the tests. A general view of this is shown in the accompanying correlation table (Table IV) in making which there has been made a correction for the range in the tests (shaded column) by taking the highest as 85% and the lowest as 15%. The Pearson correlation calculated from this table is +.74 which is quite close to the average of the correlations of the six sections made by the Pearson rank method.

The results of the tests show that they would be able to prophesy with a high degree of approximation when these pupils entered the school (if the tests were applied then) just what their fellow pupils and teachers would think of them as far as brightness is concerned, six months afterwards.

The question as to why the combination of a couple of completion tests, a test for range of information, one for acquisition of ideas by reading, one for retention, and one for quickness should give such a high correlation with the estimates made, is one which goes back to the kind of work done in the school. The completion test, if not a test for general intelligence in all walks in life, as Ebbinghaus thought, is one which parallels pretty closely what happens in the most of the recitations in this school, and in most of the schools with which I am familiar. The teacher proceeds by making state-

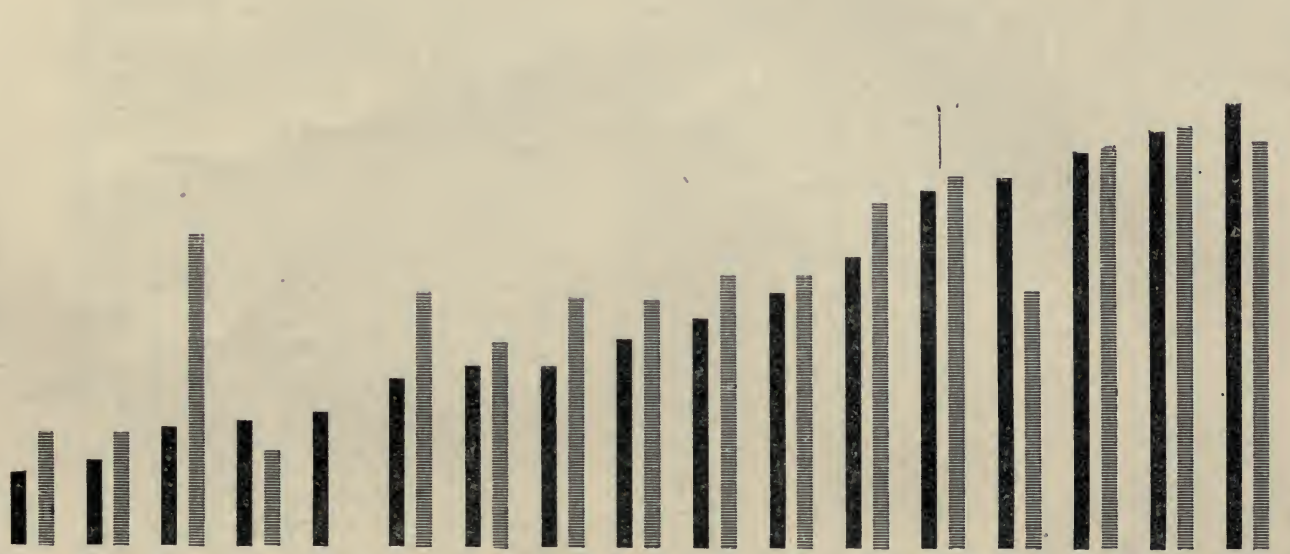

TABLE III—The black columns represent pupils estimate of intelligence, the shaded lines represent the tests. Pearson com., r = +.83.

ments, then stopping and calling on pupils, frequently volunteers, to fill in by further statements what has been said. This may be in the form of questions involving not what has

Tests.	Pupils Judgements.											
	+4	+3	+2	+1	0	−1	−2	−3	−4	−5	−6	
+4	5	2										7
+3		1	1	1	1							4
+2	2		3		2							7
+1	2	2	5	2	6		3		1			21
0		2	1		1	2	1	1			1	9
−1			1	1		4	3	1	3			13
−2				1				2	1	1		5
−3			1			3	1	1		1		7
−4					1			2		1	1	5
−5					1		1		2	1	1	6
−6									1		1	2
	9	7	12	5	12	9	9	7	8	4	4	86

r = .74. P. E., .039.

TABLE IV.

been learned but what will require some general knowledge and ingenuity in filling in. This is held to stimulate thinking, and there seems to be little doubt that it does stimulate a certain kind of thinking, principally of a rapid reproductive character. The question remains open, however, whether there is not thinking perhaps of a more independent kind, which is not favored by this usual school practice. Deep and individual thoughts are more likely to come slowly and after meditative seclusion and to require nursing for some time, while thoughts which have a purpose other than that of displaying the brilliancy of the pupil, and aiding in his standing, and which may be devoted to really benefitting other pupils in the class, are not likely to be prominent in the ingenious, the quick and sometimes risky responses of the usual "filling in" procedure.

The other tests used simply followed up this prevalent school practice. That is obvious in the case of quickness, and almost equally so in quickness of acquisition by reading. The

range of information shows probably also a tendency to take a real interest in knowledge, since a great many of the words in the test which the pupils were able to define were from their high school course. Some pupils were able to define as many as 25 to 30 of these words while others sank as low as 4 to 7. The value of the test for retention does not need to be dwelt on. Some part of the class work usually calls for retention, either of matter read or of material previously dealt with in the class.

The value of these tests for the individual teacher, apart from their value as an indication of the kind of work done in the school as a whole, would seem to be that a means is afforded, at the beginning of the school year, of getting a fair approximation of the results of future experience. In the cases of those who stood high in the tests, but low or medium in the estimates, as a result of interviews and special observations of them, as well as from their own statements, the present writer is decidedly of the opinion that they have much more power to succeed in the class work than they show. Sometimes this holding back was due, according to the persons themselves, to laziness, sometimes to timidity, and sometimes to a strong disgust for the whole business of the struggle for marks. Other elements of character doubtless enter in, such as procrastination, and sometimes there may be an element of special interest in and facility in the tests themselves. With these sources of error in mind, however, it would seem that by means of such tests the teacher is placed in the position of distinct advantage in getting more quickly to understand the nature and capacity of his pupil.

EXPERIMENTAL RESEARCHES ON LEARNING TO SPELL. I.

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I. The Teachers' Attitude towards Spelling.

There is probably no teacher of ripe experience who believes that children will absorb spelling without direct learning; though the case for unconscious absorption, practised under certain conditions, is probably not so weak as many teachers think. But they turn a deaf ear when one tries to induce them to give unconscious absorption a trial. "What," they say, "and ruin the spelling of the class all through its school career!"

The case is far otherwise when one speaks of the teaching of spellings and the different ways of learning them. Eagerness and critical attention take the place of contemptuous denial, and there is no lack of willing coadjutors when one proposes some experiments on different methods of directly learning to spell. For teachers, one and all, want the spelling of their pupils to be fairly accurate, one and all they want to achieve this result in as little time to the children and with as little labour to themselves as possible (an ideal I heartily commend, for a teacher's energies should not mainly be expended on routine duties). And nearly all of them say that the spelling of their pupils is bad. Their dissatisfaction with the present spelling is partly a consequence of an ideal of spelling in elementary schools which was pitched too high; for the polysyllabic generalities of leader-writers were once the tests of reading and spelling in these schools.[1] That day has gone by but its influence lingers. Still, even allowing a fair discount, here and there, for a standard pitched too high, there

[1]See W. H. Winch, *Problems of Education*, page 128. Sonnenschein. 1900.

must be granted a considerable justification for the teachers' complaint. To me it has always seemed somewhat of an absurdity to teach spelling by dictation, as most of us do today. Dictation is one useful form of determining whether spellings, supposed to have been learned, have actually been acquired; but how it teaches spellings, except in as much as every effort to express them clears up our percepts, I fail to understand. Transcription is still more of a broken reed. Little children have no great objection to copying words and sentences: on the contrary they like it; but they will, if undirected, copy letter by letter (I *have* seen a child copy *the parts* of a letter separately, looking up at the black-board for each stroke); and they will *not* be found, when all the copying is done, to have acquired much correct orthography.

A useful variant in the practice of transcription is to allow a certain time for exposure and then to cover up the word or phrase, leaving the children to copy it from memory. Children find this a most interesting exercise, and will learn a considerable amount of correct spelling in this way. Of course it needs some supervision, and, if the acquisition of accurate spelling is the object, is probably not the best method. Still it is a good one, and at once reminds the teacher, if he knows anything of experimental psychology, of those memory experiments, in which, after looking at something for so many seconds, he is required afterwards to write down what he has seen. It is, indeed, an exercise in visual memory.[2] Then the teacher, with some modern knowledge of educational theory, is apt to remember more about his psychology and to ask questions about visual memory and auditory memory; and, if he be very modern, about motor memory. Then he remembers that he has been recommended to use combinations of these memories, since combinations are said to be better than single memories. One teacher I found calling out words, letter by letter, whilst his boys were learning them visually, letter by letter, from the black-board. He was going slow and the boys were going fast, so at first, he muddled them a good deal; but I

[2]As the method of apprehension may *not* be the method of retention—sounds, for example, may be translated visually and remembered that way—it would be more correct to say the memory from visual perception.

noticed that most of the boys soon ceased bothering with teacher: they 'inhibited' his contribution, and came through quite well. The teacher attributed their success to the combined auditory and visual method. It was, of course, for most of the boys, a visual method with an inhibited auditory stimulus, and in no sense whatever a combined method. But let us look a little further into the psychological issues.

II. The General Results of Psychological Experiment.

This is not the occasion on which to enter into a protracted discussion as to the varied experimental findings of the psychologists who have investigated these questions. A brief aperçu is all that I can hope to give. First of all I purposely omit all reference to experiments on adults. Children and adolescents, we are quite sure, are unlike adults physically and morally, and it is quite time that we realized that they are also unlike them intellectually. To this fact child-study societies owe their stimulus, their justification, and their future. To this fact also the educational psychologist owes the special material of his science.

But even if we eliminate the adult we can but say that psychological experiment, so far, speaks with an uncertain voice. W. A. Lay,[3] from the results of experimental work with children, came to the conclusion that motor memories, whether articulatory or graphic (tracing the words in the air), acting in combination with other memories, gave better results than those memories (visual and auditory) when acting alone.

Smedley[4] found that, generally speaking, combined memories were better than single ones, though he also found that *tracing* numbers on paper whilst learning them was a disadvantage.

Pohlman[5] showed that, with *some kinds of material,* auditory memory was best at first, but that the visual memory improved with age, and finally became the best for *all material.* Auditory plus visual apprehension was generally better than

[3] *Experimentelle Didaktik,* 3rd Ed. 1910, pp. 297-305; 351-370.

[4] Report of the Department of Child-Study and Pedagogic Investigation, Chicago. 1900-1901.

[5] *Experimentelle Beiträge zur Lehre vom Gedachtnis,* 1905.

auditory by itself. The addition of a motor factor, he found, lowered the result.

Though there appears a balance of experimental justification in favour of combined memories, there *are* researches which indicate the superiority of a single mode of apprehension, and all readers of pedagogy will know of Meumann's sustained argument against what he believes to be the spurious motor factor of Lay. I have myself[6] tried to contribute something experimentally to the discussion, showing the condition under which the motor factor is helpful, and also, with the same children, the conditions under which it is not. And there is much more work on the lines of the above researches awaiting compilation. But for the present I am disposed to present the problem in a form in which it will be more intelligible to teachers than if I were to use nonsense syllables or unassociated letters or numbers. I propose to use actual words which children will need to know.

III. General Plan of These Experiments.

If we are to use actual words the great problem is, of course, to find lists of words of equal difficulty; for they may be suitable for one class and not for another, even of children of the same 'standard' or 'grade.'

Let us make an attempt to pick out two lists of words of equal difficulty for a given class. Then let us test our selected lists by setting the spellings to be done. The average results from the two sets should be practically identical, and the coefficient of correlation between the two series should be very high. That will mean that any boy, say Alfred J——, for example, does about as well or badly, compared with the other boys, in the one list of words as in the other. We have now, we will suppose, obtained two lists of words of equal difficulty. Next comes the practice period. For several days or weeks, as the case may be (it is always unsafe to trust to single practice exercises), let one set of words be taught or learnt in one way and the other set of words in another way, the lessons

[6] W. H. Winch, *A Motor Factor in Perception and Memory.* Journal of Experimental Pedagogy. June, 1912.

being so arranged in time and sequence that one set of words has no advantage over the other in the general conditions under which it is studied. Then, after an interval, let us test the results of both methods. Which set of words is known the best? The averages of the two lists are, of course, the determining figures. But it is unsafe to draw any conclusions at all without a close correspondence, all along the line, between the results from the one list and the results from the other, unless, of course, there is an enormous difference between the averages.[7] The positive correlation should be high. And if it is, a very small difference between the averages will be significant, that is, will give us ground for valid inference.[8] These general descriptions of method will probably become plainer to those who have never tried for themselves when I pass to the details of the experiment.

IV. A First Experiment with Standard II. Boys.

Average Age 8 years 9 months.

i. *The Boys who did the Work.*

First of all, what sort of a school was it in which the experiment was carried out and what kind of boys were they who did the work? These are preliminary questions which everyone who experiments with school-children should be prepared to answer. Many apparently contradictory results fall into line and become intelligible when these facts are understood. This school was a municipal elementary school for boys situated in a poor neighbourhood in the East-end of London, attended exclusively by the children of Jewish aliens. It was a small school, not considered of high pedagogical proficiency, but rapidly improving. The mental level of the boys was well known to me from a series of mental tests that had been administered throughout the school. There were practically no 'defectives', and very few boys who would technically be called

[7] An enormous difference would, however, really convince an experienced experimenter with children, that he had muddled the thing somehow.

[8] I have set this out clearly by means of simple examples in a Statistical Preface to my *Inductive versus Deductive Methods*. Warwick & York, Baltimore, U. S. A. 1913.

'backward'; still the level of ability was not high. In rapidity and accuracy of numerical calculation the boys had shown to advantage, but in several other respects had fallen below, rather than above, English school children of a corresponding social class. They were rapid and proficient in the acquisition of English, and they were ahead of English boys in linguistic *fluency;* their inadequacies, contrary to what one might have expected, were not predominantly linguisitic. They were supposed to spell badly; but that is a common complaint in schools: I am not aware that it had any special justification. I now proceed to the details of the first experiment.

ii. *The Lists of Words of Equal Difficulty.*

I need, perhaps, hardly say that words must be chosen of which no boy can spell the whole, and with which most of the boys can accomplish something. So, this being a Standard II class, we selected the words from a reading book used by the class above, namely, Standard III. The following were the words picked out:

The List of Words called Set A.		*The List of Words called Set B.*	
opposite	quarrel	secretly	nostrils
pleasant	astonish	ancient	dwarf
precious	guard	breadth	listen
ceilings	oysters	umbrella	silence
neighbour	elephant	surprised	leopard
splendid	companion	foreign	special
fault	believed	receive	guessed
measure	whispered	circle	future
question	lazily	poisonous	officer
grieved	parlour	unknown	tasteless
telegraph	accidents	quarter	biscuit
valuable	enough	crutches	scented
sovereign	machine	rascal	juices
shrieked	miserable	rough	yawn
sleeve	noticed	holiday	jealous.

iii. *How the Test Words were Administered.*

They were called out by the experimenter, each word once, and then written down, one by one, in small hand, by all the boys taking part in the experiment. The words of Set A were called out first and then the words of Set B. This was an error in procedure. It had been arranged that the words

from Set A and Set B should be called out alternately, one from Set A and then one from Set B, and so on. But this was not done. Hence a fatigue factor *may* have lowered the number of correct spellings for Set B. In result the words of Set A and Set B were equally well done; but if a fatigue factor did operate, that would mean that Set B is really slightly better known than Set A, and is, therefore, easier for this class. This must be borne in mind when conclusions are drawn from the results.

The actual averages, correlation-coefficients between the results of the two sets and the 'probable errors' of their difference will be shown later on. For the present it is asked that it may be granted that for these boys the words of Set A and of Set B are of equal difficulty.

The Preliminary Test was given on Friday, January 31st, 1913.

Chronology of the Teaching Practice for Set A and Set B.

On the following Monday morning the practice series began with Set A at 9.45 a. m., a lesson lasting exactly 10 minutes, following a Scripture lesson. At 2.05, on Monday afternoon, immediately after assembly, the practice series began with the words of Set B, a lesson again lasting exactly 10 minutes. On Tuesday morning at 9.45 a. m. the second practice period of 10 minutes was taken with Set B, and in the afternoon at 2.05, the second practice period of 10 minutes with Set A. A third and fourth period of the same length and corresponding times was given to Set A on Wednesday morning and on Thursday afternoon, whilst a third and fourth practice period of 10 minutes each at corresponding times was given to the words of Set B on Wednesday afternoon and on Thursday morning. These alternations from morning to afternoon were made, of course, so that neither list should suffer any advantage or disadvantage of time or placing in the school curriculum.

v. *How Each Test was Learnt in the Practice Series.*

The words of Set A were shown on a black-board, and the Head Master, a man much practised in experimental work,

spelt each word carefully, with slight pauses between the syllables (though these were not pronounced) and a clear distinct pronunciation of each word after spelling. Then the boys, simultaneously, word by word, after the experimenter, in an audible voice, looking at each letter as they named it, spelt each word twice. This took 9 minutes. The remaining minute was given to a second spelling of the words near the middle of the list.

The words of Set B were learned in another way. The Head Master read the list through, carefully pronouncing each word, and the boys were told to learn the words silently by looking at them. It was intended that there should be no audible articulation of the letters; but, in practice, every boy did, as teachers say, 'mutter the letters and words to himself.'

vi. *The Analysis of the Two Methods.*

The method adopted for Set A was a visual, motor-articulatory, and auditory method, with attention directed throughout by the experimenter. The method adopted for Set B was a visual method with much less contribution (if they do contribute) from articulatory and auditory factors. The attention of the children, after the preliminary reading by the experimenter, was *not* directed; but they appeared to be working all the time. They appeared to be working fast, and they undoubtedly made more visual repetitions in the given time than they did with the words of Set A. Here, then, we have two school-methods in actual practice (for the methods were not invented for the purpose of this experiment) subjected to an exact experimental verification, the one a combined simultaneous method with directed attention, the other predominantly visual, each boy working by himself.

vii. *The Final Tests with Set A and Set B.*

On the following Monday, after a three days interval, the work was tested by the dictation of the lists at 9.45 a. m., one word being dictated from Set A, then one from Set B, and so on. The results are shown in the tables subjoined.

viii. *The Results of the Preliminary and the Final Tests.*

By the preliminary test I mean that which was given before learning, to show how far the selected lists of words, Set A and Set B, were of equal difficulty for these children. By the final test I mean the test which was given after the practice periods, the words of Set A having been learnt in one way and those of Set B in another.

I shall show how the individual results are tabulated, since it may help teachers who desire to repeat the experiment.

Table I, showing how the Results of each boy's work were tabulated.

	Test before learning. Number correct out of		Test after learning. Number correct out of	
Name.	30 words of Set A.	30 words of Set B.	30 words of Set A.	30 words of Set B.
S. Dorin	27	24	30	30
B. Baron	21	21	30	29
I. Warchauski	16	18	29	29
H. Gencherousky	13	13	29	28
..	..	..	..	..
L. Gluckstein	7	4	26	14
..	..	..	..	..
S. Warchauski	6	10	19	18
M. Preskov	5	4	14	10
S. Alexander	5	6	27	19
..	..	..	..	..
M. Berman	2	4	25	22
I. Cohen	2	0	14	11
..	..	..	..	..
T. Levy	0	0	1	1
53 boys, Averages	5.5	5.7	17.6	15.8

Comments on Table I.

It certainly looks as if the two lists of words were well chosen, for they are equally well done at the start: it also appears that the method by which Set A was learnt is superior to that by which Set B was learnt. It seems also, and this we must not forget, that they were *both* good methods, for an enormous improvement has been shown in both cases, an improvement due to 40 minutes practice for each set, spread out over 4 days. The final test was given, it will be remembered, after 3 days interval, and on Monday morning—a bad time pedagogically. But of course, the difference in the average results of the two methods, 17.6—15.8, *might not indicate any-*

thing at all of a general nature. The method for Set A might be better for good boys, and the method of Set B for weaker boys or vice versa. Even a big difference between the averages might not really indicate anything about our methods; it might even be due to variations which, as we do not understand them, we call 'chance' variations. How then can we show that our differences are differences all along the line and so possess logical significance? One such way, easily understandable by those who have no special statistical knowledge, is by means of the following—a grouped correlation table.

Table II, showing, section by section, the Number of Words Spelt Correctly before and after Learning.

Number of words of Set A correct before learning.	No. of boys.	Before learning. Av. No. right in Set A.	Before learning. Av. No. right in Set B.	After learning. Av. No. right in Set A.	After learning. Av. No. right in Set B.
14 to 27	3	21.3	21.0	29.7	29.3
11, 12, 13	5	12.2	12.2	26.6	25.6
8, 9, 10	6	8.9	10.7	25.2	23.3
6, 7	8	6.6	6.8	22.9	21.2
5, 4	7	4.9	4.0	18.7	12.3
3, 2	12	2.2	2.0	15.1	13.5
1, 0	12	0.2	0.8	5.5	5.3

Comments on Table II.

The regularities of this table are quite beyond the realm of 'chance,' and show a clear victory for the method employed for Set A all along the line. The teacher who repeats this experiment should now turn to his list of individual results; he will probably find eight or nine per cent. of the boys who do better with the method employed for Set B; but he must not assume, without further experiment, that that is because the B method is better, even for them. It *may* be so, but the only clear and certain thing is the superiority of the A method for the class generally. If a fatigue factor operated in the preliminary work with Set B, the conclusion is strengthened.

ix. *Statistical Evaluation of the Results.*

It is useful, most useful, to have the results of all experiments drawn out for each child individually as in Table I. If they are 'jumpy' they may as well be thrown away. But if they are regular, it is useful to make sectionized tables of correlation as in Table II. This shows us not only the *reliability*

of our results, but also—a most important issue to teachers—whether strong and weak pupils are affected in the same manner. But a third and much shorter way may be adopted of showing the validity of the conclusions. *After* the individual schedules, and *after* the tables of grouped results, a more precise evaluation may be adopted. For this we need to know averages, correlation-coefficients and 'probable errors'. The correlation-coefficients have been worked out from the individual cases by the Pearson formula $r = \frac{\Sigma\ xy}{n\sigma_1\ \sigma_2}$, and the 'probable errors' of the differences between the averages from the formula 'p. e.' $= .67449\ \sqrt{\frac{\sigma_1^2+\sigma_2^2-2+\sigma_1\ \sigma_2}{n}}$, the usually accepted formula of statisticians.

Before learning, the results for Set A averaged 5.5, those for Set B averaged 5.7. The correlation-coefficient between the A list and the B list is +.93. The difference between the averages is .2 and the 'probable error' of this difference is .19. This means a practical identity of difficulty between the two lists as far as these boys are concerned. After learning, the results for Set A average 17.6, and for Set B average 15.8. The correlation-coefficient between the results for Set A and Set B is +.90. The difference between the averages is 1.8 and the 'probable error' of that difference is .36. Thus the difference between the averages is 5 times its 'probable error', a most conclusive verification of the significance of our results.

This section is inserted for the use of experimenters; it is not intelligible, as it stands, to those who have made no study whatever of statistical methodology.

x. *Conclusions from the First Experiment.*

I shall begin by saying what is *not* proved; for nothing is more disappointing to an experimenter than to find his results misinterpreted. An experiment in educational psychology is generally directed to a particular issue, it is not usually (though it sometimes is) susceptible of complete adoption as a method of teaching. And in this case I should be sorry to find teachers picking out lists of words, thirty at a time, and

without any reference to their meanings, or to their applicability in a context, or to a graded system of learning reading within which they should occur, setting their boys to learn them. And I want to emphasize the point that this experiment does not show that an incidental method of teaching spelling is wrong.[9] An experiment with groups of children, equal in their capacity to spell, could be arranged, given willing and scientific co-operation on the part of the teachers, so as to show whether a direct or an indirect method were the better. But teachers, as I have said, distrust the incidental method, and do not care to try it. Their reluctance might be partially removed if educational authorities and His Majesty's Inspectors of Schools would not count a failure against a teacher conducting an experiment, even if the experiment proved the method employed to be a bad one. Of course I mean *serious* experiments, where every proper precaution is taken and every result kept and tabulated for every child, with a complete chronology of the teaching and testing. There is little value in mere hap-hazard trials. I have not the slightest doubt of the sympathy of His Majesty's Inspectors; they have shown it so many times to my own students; but all local authorities are not equally enlightened. However, we may still hope. Let us then set aside the incidental method for the present. What have we proved? We have proved for boys of Standard II in a school very poorly situated 'down East' in London that, when they are set to acquire the correct spelling of words, they learn them more readily by a method in which their attention is directed by the teacher, letter by letter, and when there are marked motor-articulatory and auditory factors as well as visual ones, than they do by a method in which they learn visually and more or less silently by themselves. But both these methods have been shown to be good.

How far can we generalize these results? Before presenting further experiments let me suggest one or two important considerations. These are *young* children and they are *not of the highest type* of elementary school children. Will not

[9]See WALLIN'S *Spelling Efficiency*. (Warwick & York, Baltimore, 1911,) for a discussion of the incidental and direct methods.

motor and auditory factors, therefore, affect them in a way in which less primitive children will not be affected? It *may* be so; let us keep the possibility in mind. A further possibility: these boys, though they worked hard enough at these spellings, had not been accustomed in this school generally to work much by themselves visually and without articulation—at least, not with much profit. Have we tested merely a failure of their habitual school practices? To settle this we might try some experiments more strictly psychological, such as I may present later on. And we might make the same experiments in other schools well-situated, with English children, and with older children, girls as well as boys.

For the present what *is* proved is the superiority of a more combined method, the first with attention directed by the teacher, letter by letter, the second not, when the mental ability of those using the method is low and undeveloped. Further experiments may clear up our outstanding possibilities one by one.

(*Concluded in the December number.*)

MENTAL AGE TESTS.

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The tests discussed below are a part of those described in Dr. Squire's articles in The Journal of Educational Psychology in September, October and November, 1912. Some of them were given in the same form as there outlined and some were modified, and in arranging for them Dr. Squire's helpful suggestions were of great value. The work was done by the writer as he found time, with a limited amount of assistance from one efficient helper. In order to do as much as possible in a limited time, some of the tests were arranged and given by classes. Only one of those used was modified in any other way. The children are of English and French-Canadian descent, taken without selection, and there was no elimination of records in making the averages except in a very few cases where the knowledge of English was too small to make the answers of value. The tests were given in February and March, 1913, and in reckoning averages for each year, all children were counted whose age was within six months of the year under consideration on March 1.

The papers for the "a" test for perception and concentration were prepared on the Neostyle, and consisted first of 100 a's in groups of five, a second part of 100 a's distributed ten to a line in short nonsense syllables, and a third part like the second, but with a different arrangement of syllables. This test was given by classes, 30 or 60 seconds being allowed for the first, according to grade, and 60 seconds for each of the other parts. While the third part was being done by the children, a paragraph from a lively bear story was read by the examiner. The time needed for crossing out 100 a's was cal-

culated in each case, and the difference between the time of the first part and each of the others was taken as the measure of perception and concentration, respectively. The following table shows average results:

"A" TEST.

Age	7	8	9	10	11	12	13	14
Number tested	38	48	53	65	48	53	69	48
Av. Motor Time, sec.	96	92	71	66	62	52	49	47
Motor Percep. Time	207	186	158	142	126	111	101	98
Perception Time	111	94	87	76	64	59	52	51
Av. Deviation	26	29	30	25	18	13	12	9
Av. Errors in Percep.	2.9	1.6	1.5	1.3	1.3	1.4	1.3	.8
Av. Dev.	3.4	1.6	1.4	1.3	1.2	1.2	1.2	.9
Motor Concen. Time	175	156	134	120	112	99	91	88
Concentration Time	79	64	63	54	50	47	42	41
Av. Dev.	22	22	19	15	13	14	11	11
Av. Errors in Concen.	.9	.8	.5	.6	1.3	1.3	.9	.9
Av. Dev.	.8	1.0	.8	.9	1.1	1.1	.8	1.1
Failures	9	9	2	1	4	1		

The time required decreases quite regularly with increasing age, and the average deviation does not seem unreasonably large. The third part of the paper was almost without exception done more rapidly and more accurately than the second. This is referred to here as a test in measuring ability to concentrate attention, because it is so suggested in Dr. Squire's article, the idea evidently being that the reading of the story would so distract attention that work in the third part of the paper would require more time than in the second, and that concentration time, minus perception time, would be a measure of each child's power to control his attention. As a matter of fact, the reading acted as a stimulus to rapid action, and so probably would any reading that was lively enough to attract the children's attention. Questioning showed that the children had pretty generally noted the principal points of the story. Doubtless the skill acquired in doing the second part tended to increase speed in the third, and also the accuracy, as shown by the number of errors. For some reason this improvement in accuracy was much greater in the younger half of the children. Missing an "a" and crossing out a wrong letter were each counted as error. The time element would seem capable of being made a suitable measure of mental growth in perception when correct standards can be established, but the errors do not vary much from year to year, and the average deviation is so great that this part of

the test cannot have much value in determining mental age, whatever value it may have in showing the type or quality of mind in the child tested.

For the comprehension test the following pictures were used: Sympathy by Riviere, The Singing Lesson by Wunsch, Composition Day by Geoffroy, The Children's Friend by Eberle, and Lost by Schenk. These were Perry pictures, about five by eight inches, each mounted on a card, and none colored. The name was blotted out and each child was asked to give a suitable name for each picture. This test was given individually. The answers were classed as showing complete comprehension, knowledge of principal object, action, description and enumeration, and were ranked in the order named. The average score was reckoned by giving to each kind of answer a number, 5, 4, 3, 2 and 1, respectively.

COMPREHENSION TEST.

Age	6	7	8	9	10	11	12	13	14
Comp. Comprehen., per cent	0	0	1	4	7	5	8	15	12
Prin. Object, per cent	0	1	1	4	5	5	10	11	19
Action, per cent	3	5	15	26	23	26	20	20	22
Description, per cent	7	20	24	32	49	41	50	43	37
Enumeration, per cent	90	74	59	34	16	23	12	11	10
Average Score	5.9	6.4	7.8	10.3	11.8	11.1	12.9	13.1	14.2
Av. Dev.	1.1	1.2	2.1	3.0	2.0	2.6	2.5	3.0	3.2
Number Tested	22	47	59	55	59	43	52	73	53

The results show a fairly regular increase in ability with a tendency to slower development at some period between the ages of 9 and 12. The averages are lower than those obtained by Dr. Squire, which may be accounted for in several ways. The method of determining the average for each age is different. In the present case half the children were younger than the age named, but none more than six months; in Dr. Squire's reckoning, none was younger than the year and none more than six months older. The children whose tests are recorded here are probably not so familiar with the study and interpretation of pictures, and the writer claims no skill as a judge in such a test. As a measure of the child's growing comprehension it seems valuable. The chief difficulty would seem to be to secure uniform judgment on the very various titles children can give.

The visual memory test was given by showing each child

separately a card about fifteen by eighteen inches having on it pictures of twenty common objects, namely: clock, book, watch, girl's head, shoe, man's head, bottle, glove, gun, hammer, house, dog, slipper, boy on sled, piano, knife, hat, engine, chair, collar. The exposure was for thirty seconds, and the child immediately named all the objects he could remember. For the auditory test the following series of sentences was constructed, each two syllables longer than the preceding.

1. Come in.
2. See the cat run.
3. Place the book on the chair.
4. The wolf came running through the fields.
5. The path of the moon lies across the sky.
6. I must have a boy to watch my sheep and cows.
7. As the light grew brighter she saw what had happened to him.
8. Then was seen the greatest fight that the sun had ever looked upon.
9. As the magician lay in a sleep a great serpent came softly from the woods.
10. The heavens have the summer all the year, but the earth shall have summer half the year.
11. Every day I will watch for you and every night I shall build a fire on the mountain top.
12. The warriors caught the younger boy up gently and carried him far away from his home and friends.
13. They were at the foot of the mountain, but the people no longer feared them, for now they were not men but rocks.
14. How can they know when it is night when they have no sun and no moon to tell them when it is day and when it is night?
15. The man gave the pearl to the king and then went home wishing that no one would ever talk to him again of his sense of smell.
16. Thunder and Lightning were talking about whom to invite and they questioned whether to ask the sun, the moon and the wind to come in.
17. The Indians can see a hare in the moon, and this is the story that they tell their children about it when the moon is shining at its full.
18. Far away in the forest there once lived the most cruel man in all the earth, who had often shot a rabbit and once or twice he had shot a man.
19. One day a hunter when on his way home heard a baby crying in one of the wigwams and he ran to it hastily to see what he could do for it.
20. For many days they traveled, and at last they came to a high mountain upon whose summit the sky seemed to rest, and when night came he put a great jar over the cat.
21. Some magicians are cruel, but others are gentle and good to all the creatures of the earth, and it was one of these who came into the house this morning when the sun shone.

These sentences proved to be not perfectly graded, Nos. 7 and 9 being more difficult proportionately than the others. One sentence after another was read, the child immediately repeating till a mistake was made.

MEMORY TEST.

Age	6	7	8	9	10	11	12	13	14
Number Tested	18	50	51	50	52	42	45	63	47
Av. Score Visual	5.3	6.1	6.0	7.3	7.5	7.5	8.4	9.2	10.
Av. Dev.	1.2	1.4	1.2	1.9	1.7	1.6	1.8	1.5	1.8
Av. Score Auditory	5.3	6.0	6.2	7.2	7.4	7.7	8.0	8.3	8.5
Av. Dev.	1.2	1.3	1.4	.9	1.1	1.3	1.1	1.2	1.2

The changes from year to year are not large, especially in the memory of sentences, but the progression is steady, and the periods of rapid change and comparative rest are quite plainly marked.

For testing learning power the Maltese cross test was used, and also a modified color and number test, both arranged to be given by classes. Four equilateral triangles were placed on a large card in form suggesting a Maltese cross and numbered from one to four. Groups of triangles in the same positions, but in different order and without numbers, were on the papers before the children. The large card was exposed for a brief time, perhaps five seconds, and the children asked to put the same figure in each triangle as appeared in the corresponding one on the large card. Most of the children under 11 had eight chances, those older only six.

MALTESE CROSS TEST.

Age	6	7	8	9	10	11	12	13	14
Number Tested	23	50	51	47	55	44	46	61	42
Failures	17	22	22	8	7	8	11	6	6
Av. Trials for Success	3.0	3.1	3.4	3.0	2.5	2.3	2.2	2.5	2.5
Av. Dev.	1.3	1.1	2.1	1.8	1.4	1.1	1.3	1.4	1.4

The results do not agree well with those obtained by Dr. Squire, and the slow change and wide deviation seem to indicate that it is not a very helpful test in determining mental age. The great drop in the number of failures between ages 8 and 9 is striking.

For the color and number test the two groups of three forms used by Dr. Squire were placed on a large card each filled with a different color and numbered below from one to six. On the children's papers were two rows of the same figures in different orders and without color or number. The large card was shown about five seconds, and the children asked to fill each form with the same color as appeared on the large card and put the same number under it. The same thing was repeated with the second row of forms. The first

trial was counted as a preparatory one, and the results of the second reckoned up.

COLOR AND NUMBER TEST.

Age	6	7	8	9	10	11	12	13	14
Number Tested	26	42	49	42	53	39	45	57	42
Av. Score Color	2.3	3.3	3.0	4.0	4.0	4.2	3.7	4.2	4.2
Av. Dev.	1.2	1.2	1.3	1.0	1.3	1.3	1.5	1.5	1.4
Av. Score Number	.6	1.2	1.4	1.7	2.1	2.2	2.3	3.2	3.0
Av. Dev.	1.0	1.0	1.2	1.2	1.6	1.7	1.6	1.5	1.6

The results, especially as to the number memory, are not very satisfactory, and the test could evidently be put in better form. This is the only test used which was changed in any way except as necessary in giving to classes instead of individuals. The implication one might derive from the color score, that children reach their maximum ability to learn at about 9, is something that must be considered as important if true, and is certainly worthy of further inquiry.

For an association test one set of twenty words was used, practically the second set in Dr. Squire's article. Each word was read to the child, and he was asked to give the opposite idea as quickly as possible. The time required, noted in this as in other tests by the use of a common watch with second hand, and the number of mistakes made were recorded. It was not possible to finish this test in the lower grades, so that the records are of little value below age 9.

Again the time shows steady gradation, but the errors seem to depend on some other characteristic of the mind than its increasing maturity.

ASSOCIATION TEST.

Age	7	8	9	10	11	12	13	14
Number Tested	7	19	46	50	41	44	58	49
Av. Score, sec.	118	118	108	101	98	82	79	71
Av. Dev.	17	17	23	20	21	20	21	16
Av. Errors	4.1	4.2	4.5	4.7	4.8	3.8	3.6	3.2
Av. Dev.	1.3	2.2	2.2	2.0	2.2	1.9	1.9	1.6

A comparison of individual records has been made to see if any relation would appear between the tendencies to error in the association and perception tests and the power of learning as shown by the Maltese cross test. Of all those who made two or less errors in the association test, 76% made only one error or none in the perception test and 47% did the Maltese

cross test in one or two trials. Of those who made five errors or more in the association test 42% made two or more in the perception test and 34% required four or more trials in the Maltese cross test or failed. The average number of errors in the association test for all children is between 4 and 5. All the children who made four or less errors in this test averaged 1.1 errors in the perception test. About one in six failed on the Maltese cross, and the rest required an average of 2.8 trials. All the children who made five or more errors in the association test averaged 2.2 errors in the perception test. One in four failed with the Maltese cross, and the rest required an average of only 2.2 trials to do it.

The study of these tests has proved very interesting, and even in this incomplete form gives results in individual cases quite in harmony with the observation of teachers and the evidence of school room work.

THE EDUCATION OF DEFECTIVES AND THE TRAINING OF TEACHERS FOR SPECIAL CLASSES.

E. B. HUEY,
Johns Hopkins University.

The Teacher's Qualifications.

Defectives in the schools should all be placed in special or ungraded classes with not more than 15 or 18 in a room. The selection of suitable persons to conduct such classes is a matter of the utmost importance, and there are two or three qualifications which can not be too much insisted upon.

(a) Teachers of special classes should have as a first requisite superior intelligence, originality, sprightliness of ideas, and live interest in social problems. Intelligence is imperative for they should be allowed to make their own course of study absolutely, and a different one for each pupil. Because of the superior ability which is required the salary should be about 25 per cent higher than that paid to the regular teachers.

(b) Experience in manual and industrial training, kindergarten, and the work of the first three or four grades, are the things which will help them most. Experience in social service work, whether as volunteer or settlement worker, charities agent or probation officer, is equally important with experience in teaching.

(c) The ability to do efficiently all the work of a household, including the care of children, cooking, cleaning, etc., I should place as the experience most necessary of all, an experience that ought to be acquired at once by the prospective class teacher in case she does not already possess it. These are the first things she will need to know.

(d) Some special training in the psychology and pedagogy of mental deficiency is also desirable, and this should include, where possible, actual class room work with defectives. The more theoretical part of this training is now offered in a number of universities, but the practical training needed is not offered except at a very few summer training schools, notably at Vineland, New Jersey, and at the University of Pennsylvania.

If the teacher can not get to either of these summer schools, she is at least as well off as I found the teachers of special classes in Chicago, and as well off as they are in most cities. Whether she is able to secure this training or not, the special class teacher should have the other qualifications mentioned. She should begin by brushing up her wits. Constant reading of such literature as "The Survey," "The Training School," etc., will help to get her informed and will encourage her by showing how her work is part of a great and very hopeful social movement. She will thus escape the discouragement which is so likely to result if she thinks only of the unsatisfactory progress of some of her pupils.

The Work of the Special Class.

The special class should receive all pupils who distinctly fail to make progress in the regular class or who seriously interfere with or fail to be amenable to the methods and work proper to the regular class. Two distinct kinds of pupils will thus be removed to special class. (a) There are pupils who get behind or in trouble, not because of arrested mentality, but from poor health, irregular attendance, defective vision or hearing or speech, unsuitable parental discipline, bad habits, bad company, or what not. They are retarded but not arrested; they may be very troublesome and bad, but they are not degenerate. They have the future of persons of normal intelligence; and though they need to be in a special class in order that they may have individual attention and at the same time relieve the regular class, their work should be along the lines of regular classes, with only more emphasis on the manual and motor, and they should eventually be made to regain a place in a regular class even though in a lower one.

(b) The second kind of special class pupils are those who are retarded, or unstable, not from some local cause or remedial circumstance of environment or discipline, but from deep-seated arrest of brain growth or perhaps from injury to or disease of the brain. If the brain arrest will not let their minds grow to a strength and efficiency beyond that of a child of twelve years we call them feeble-minded. If the arrest is not so severe as this, but is sufficient to keep them always as irresponsible mentally as boys and girls of the early teens, we call them mentally defective or neurotic, but not feeble-minded.

There is no cure for feeble-mindedness. Children who belong to this group will never do the work of the upper grades satisfactorily. When they learn at all it is by rote and parrot-like. Their work in life, from their permanent shortage of brains, will never be such as to call for the preparation given in the regular classes. Training in the proper care of their own person and clothes and instruction along the line of household duties, and the simplest kinds of self-supporting industrial work, together with habits of cleanliness, politeness, morality and helpful service should be the all in all of what the school attempts for them. These things really should be the foundation of all education; but defective children must get such training and get it well. Afterwards we may add a little of the book and number work if they seem to like it and if there is time for it.

The special class teacher should be set free from two woefully mistaken assumptions. One is that all children need to be taught the three R's. These children do not. They waste their time and lose their courage every day that they are kept at it. In the words of Superintendent Johnstone, "The feeble minded child needs of the three R's only enough to enable him to read the simplest things, to write his name and perhaps a simple letter, to count his money and perform the most elementary arithmetical combinations." There is no abstract book work that should be required of such a special class.

Another erroneous assumption is that the mere doing of certain exercises develop the brain, and that there is a limited list of exercises that will do this. It is not the mere doing, but the intent realized in the doing, that is mentally developing.

Mere doing will fix a habit, be it bad or good; but in this there is not necessarily a mental growth. Hammering and sawing, except as done to a purpose do not develop the brain of the feeble minded any more than the hoe developes brains in the "man with the hoe." Manual training teachers often suppose that there is disciplinary efficacy just in the tools and the wood and the hours of labor, and that only *certain* manual exercises have this training value. Thus we have the cults of raffia, sloyd, kindergarten gifts, special form and color work, etc. Even reading writing and numbers are often credited with peculiar disciplinary powers.

But psychologists know that a million things are disciplinary, and almost equally so if they permit the child to intelligently realize intentions which he himself has felt and conceived. Such things are those the child wants to do, and in the doing of which he must adjust means to ends until success crowns his efforts. When success of this kind is attained the child exclaims with delight and goes rejoicingly to a new task. That is the only kind of discipline which is worth while, and it can be obtained by darning a sock or wrapping up a playmate's finger more surely than by thumbing a dictionary or spelling c-a-t.

I have seen a feeble-minded girl struggle at the latter task for months without learning to do it; but the same girl learned to sew a little and gained mental comfort from it. For her the latter work was really disciplinary and the former was mental death.

The aim, therefore, should be to give to these children an opportunity to do the things which they feel to be worth while, the useful, common things, and to do them with all the intelligence at their command. It is well to begin with the child's personal habits, his clothing, the housekeeping of the schoolroom, etc. We should therefore train the child to work effectively at the simplest and most immediately useful kinds of tasks, and to keep him happy these should be interspersed with an abundance of play, games and music. Since the child has usually failed in all his previous school work, something must be found for him in which he can succeed.

It is especially desirable to begin at once cultivating in the

child the habit of doing what children should do habitually. Feeble-minded children are first and last habit-formers, and it is especially important therefore to aid them in fixing desirable habits. The teacher can begin with the room, training the children to be neat housekeepers. Scrubbing, shining things up, dusting, sweeping, cleaning windows, painting or white-washing, making curtains and hanging them, making pictures and ornaments, hanging paper, repairing locks or seats, cooking, preparing and serving lunches, caring for utensils, etc., are some of the possibilities in this line. The girls should be taught knitting and the making of aprons, dresses and other plain garments. They should be taught to iron nicely, and to wash, how to patch neatly and to keep things in order generally.

Boys, older ones at least, should be placed in separate classes from the girls because they will do a different kind of work. They should be taught to be clean, how to wash up, how to mend clothes, sew buttons, do errands, and to be orderly in their actions and mannerly in their behavior. Occupations especially suited to boys are carpet-weaving, broom-making, gardening, caring for animals, book-binding, straw hat plaiting, making window boxes, wagons, toys, balls, bats, etc. Some of these occupations it goes without saying, are suitable for girls also.

The really important thing in the conduct of all this work is to see that the child succeeds in doing something day by day which he feels is worth doing. Only thus can the feeble-minded be made happy; and who will say that it is not worth while to make such children happy, seeing that nature has closed against them so many avenues of satisfaction? The play life must not be neglected, for rightly directed it ministers not only to their happiness but to their moral and intellectual development as well.

Every special class teacher will meet her own problems and these will not be exactly the same for any two children. She must know each child, his home, his family, his life history, his physical handicaps, his faults, his virtues, his accomplishments. In order to secure such information the teachers

should be given a half day (or pay for half of Saturday) to visit homes and work up clinical records for each child.

In general, the special class teacher needs to be intelligent, to use her wits, to get informed and to have the ability to make good use of freedom, for practically absolute freedom she must have to do with her children whatever seems best for each one individually.

The above suggestions apply to special class work demanding no general change in the present school system. But the problem of home supervision and home care of defectives remains to be solved, both for the sake of safeguarding the happiness and welfare of the adult defectives and in order to check the stream of degeneracy at its source. Here, more, even than in the school management of defective children, we find ourselves without satisfactory means and methods. The problem concerns the welfare of society so intimately, however, that some kind of solution is imperative.

COMMUNICATIONS AND DISCUSSIONS.

EDUCATIONAL MEASUREMENTS OF FIFTY YEARS AGO.

Professor Edward L. Thorndike has recently received through the kindness of Dr. Isaac L. Kandel the following quotation which will be of interest to readers of the JOURNAL in connection with the recent activity in the construction of educational scales in this country.

In *The Museum, a Quarterly Magazine of Education, Literature and Science,* vol. III, 1864, pp. 480-484, there is an article on Statistics of Educational Results by E. Chadwick in advocating the need of better measurement. The article begins thus:

"Much of the scepticism prevalent as to the power and value of popular education arises from the inability of the educationist, or of the school teacher, to adduce satisfactory statistical evidence of the moral or of the intellectual results from any special courses of instruction or training, as manifested in after life."

The appendix quotes the practice of Rev. George Fisher of the Greenwich Hospital School.

"A book, called the 'Scale-Book,' has been established, which contains the numbers assigned to each degree of proficiency in the various subjects of examination: for instance, if it be required to determine the numerical equivalent corresponding to any specimen of 'writing,' a comparison is made with various standard specimens, which are arranged in this book in order of merit; the highest being represented by the number 1, and the lowest by 5, and the intermediate values by affixing to these numbers the fractions ¼, ½, or ¾. So long as these standard specimens are preserved in the institution, so long will instant numerical values for proficiency in 'writing' be maintained. And since fac-similes can be multipied without limit, the same principle might be generally adopted.

"The numerical values for 'spelling' follow the same order, and are made to depend upon the percentage of mistakes in writing from dictation sentences from works selected for the purpose, examples of which are contained in the 'Scale-Book,' in order to preserve the same standard of difficulty.

"By a similar process values are assigned for proficiency in mathematics, navigation, Scripture knowledge, grammar and composition, French, general history, drawing, and practical science, respectively. Questions in each of these subjects are contained in the

'Scale-Book,' to serve as types, not only of the difficulty, but of the nature of the questions, for the sake of future reference; observing that the same numerals are used in the same order as before, viz., number 1 denotes the highest, and the number 5 the lowest amount of attainment.

"In respect to the numerical values of 'reading,' as regards accuracy, taste or judgment, it is obvious that no other standard of measurement can be applied, beyond the interpretation of the terms 'good,' 'bad,' 'indifferent,' etc., existing at the period of examination. And the same observation will apply to the estimation of numbers of 'characters' and 'natural abilities,' as determined by the united testimony of the respective masters.

"Having stated this much with regard to the plan pursued in this school, I may well add that the advantage derived from this numerical mode of valuation, as applied to educational subjects, is not confined to its being a concise method of registration, combined with a useful approximation to a *fixed standard* of estimation, applicable to each boy; but it affords also a means of determining the *sum total,* and therefrom the means or average condition or value, of any given number of results."

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The Journal is issuing a series of Monograph Supplements for the publication of more extensive researches in educational psychology. For details prospective contributors may apply to Guy Montrose Whipple, Cornell University, Ithaca, N. Y.

The price of the Journal will be advanced to $2.50 per year of ten monthly issues with the January, 1914, number. Renewals and subscriptions beginning with any of the remaining 1913 issues will be billed at 15 cents for each 1913 issue and 25 cents for issues extending into 1914.

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EDITORIALS.

POPULARIZED NONSENSE.

The 'popular science' of the Sunday newspaper supplement is very likely less harmful than we are sometimes disposed to fear, partly because the clientele that absorbs its information from this source is not of the type that affects the progress of science directly or indirectly, partly because even the less intelligent reader is prepared to discount somewhat the wonderful concoctions of the "scientific editor." When, however, monthly magazines of high repute, that claim the serious attention of many thoughtful laymen, spread upon their pages accounts of alleged exploits in applied psychology that are without the faintest trace of scientific truth, there can be little doubt that real harm may result to the progress of science. A typical illustration is afforded in one of the recent issues of a well-known American periodical which purports to explain how modern science can take a man, look him over, analyze his qualities and decide upon his fitness for various industrial requirements. This, it appears, is the latest thing in scientific management. We are told that an expert in this field, "by correlating certain principles of anthropology, physiology, anatomy, biology, and ethnology" [why

is psychology omitted?], has developed "certain general principles of the utmost value in assessing character and capacity." These highly important, newly discovered general principles are such as the following: a slow, deliberate, sure-footed stride usually expresses the corresponding mental qualities; to sign the name with initials only (J. B. Smith) indicates carelessness; to write it out in full pomposity, etc.; the man with a convex profile is aggressive, keen, alert, energetic, he with a slightly concave profile is of a slow, plodding, analytical type. Furthermore, all humanity is classified as predominately 'mental,' 'motive' or else 'vital,' and these types, it appears, are directly observable from the physical build, shape of face, etc. All human beings, again, are classified according to their degree of blondness and this "is of the greatest consequence," because the blond is aggressive and the brunet is a plodder, moderate, but reliable. Even this would be too simple: we must also take account of shape of head, because, forsooth, the "long-headed man is more farseeing, the short-headed man thinks only of temporary gain," while broad-headed men are "destructive, grasping and combative." One wonders, after perusing several pages of such "general principles" whether any touch of ironical humor was intended by the statement that the foremen and executives of a large Western company that has thousands of these analyses on file are no longer sceptical, but accept them on their "face value."

One would almost feel as if the expert psychologist, struggling in the attempt to adjust a system of mental tests to probe into bewildering complexity of mind, would better shut up his laboratory. It would seem to be a great pity that Stern, for instance, could not have known of all this scientific progress before he wrote his *Differentielle Psychologie.* G. M. W.

COURTIS STANDARD TESTS IN ENGLISH.

Animated by a keen realization of the need for standards of measurement in education and encouraged by the success of the standard tests in arithmetic, Mr. Stuart A. Courtis has turned his attention to English, and has devised a series of standard tests which he denominates Series C, and which is designed to reveal differences in ability in some of the fundamental aspects of that subject. The series consists of six tests, as follows: 1. Handwriting. 2. Dictation. 3. An Original Story. 4. Normal Reading. 5. Careful Reading. 6. Reproduction. In each of these the author has used the principle of time limits which proved so

fruitful in the earlier work in arithmetic. Test 1 contains ten lines of script letters, and in each line the letters are so arranged in four groups of five letters each that they form nonsense words. In one minute as many of these letters as possible are to be copied just below the printed script. The number of letters copied is noted and the product graded for quality by the Thorndike scale, and for legibility by the Ayres scale. In test 2 a simple story is dictated at a definite rate, the reader looking at the second hand of a watch and pronouncing groups of words at indicated intervals. The quality and legibility of handwriting and the mistakes in punctuation, spelling, and syntax are graded. The dictation leaves the story unfinished. For test 3 the pupils turn to a drawing which represents a continuation of the story, and are given two minutes to use their imaginations in thinking out the continuation and in supplying other adventures for the chief character. Five minutes are then given to write out the continuation. The number of words, handwriting, punctuation, spelling and syntax are graded as before. In test 4 a continuation of the narrative is read silently at a normal rate for one minute. The last word read is marked by drawing a line around it, and the number read serves as a score for rate. On another page is found the same passage, but certain selected words are enclosed in parentheses along with two synonyms each. The child is to strike out the extra words, leaving only the one used in the first version of the text. This constitutes a test of recognition memory for the words read. The pupils are to stop at the last word read before. The time record is taken by the instructor writing a digit on the board every ten seconds, and the child putting on his paper the last digit written at the time he finishes. In test 5 a further continuation of the story is read very carefully, so that every word may be reproduced. One minute is allowed, the last word read is marked by a line drawn around it, and at a signal the reproduction is begun on another page. Individual time is taken as in test 4. Finally in test 6 the instructor reads the conclusion of the story at a prescribed rate and on signal the pupils are asked to reproduce it. Individual time is noted as above. The series of tests is an extremely interesting one and deserves an extensive trial. The same co-operative terms are offered as for the previous series of tests in arithmetic. Further details may be secured from S. A. Courtis, 82 Eliot Street, Detroit, Mich. J. C. B.

NOTES AND NEWS.

The School Review, published by the University of Chicago Press, will hereafter be under the editorial charge of Rollo LaVerne Lyman, this year appointed associate professor of the teaching of English in the School of Education. Frank Nugent Freeman, instructor in educational psychology, has been placed in editorial charge of the *Elementary School Teacher.—Science.*

According to the daily press the members of the entering class at Dartmouth College have been given a series of mental tests in addition to their physical examination.

The pedagogical library of the late Professor Aron has been purchased by the University of Illinois for its School of Education. It comprises approximately seven thousand titles, and is especially rich in documents relating to German education in the sixteenth and seventeenth centuries. It also contains rare first editions of the educational classics, and a number of valuable manuscripts.

Dr. Lewis M. Terman, associate professor of education, Stanford University, has been elected a member of the permanent International Committee on School Hygiene and has also been made the vice-president of the Council of Thirty of the American School Hygiene Association.—*Science.*

Mr. W. H. Winch, the well-known English experimentalist in education, has returned to his duties as Inspector of Schools for the London County Council, after several years' absence on leave. Mr. Winch has been devoting his time to experimental investigations on London school children,—a work which he has prosecuted with much assiduity and success. Some of the results of these investigations have recently appeared in the Educational Psychology Monograph series, and another monograph is announced for early publication in that series.

Mr. H. G. Childs, professor of educational psychology in the Brooklyn Training School for Teachers, has accepted an appointment to the chair of educational psychology in the University of Indiana.

A. L. Hall-Quest, formerly Professor of Philosophy in Westminster College, and C. L. Harlan, last year instructor in the Central Normal College, have been appointed assistants in education in the University of Illinois.

W. A. Cook (Ph.D., Wisconsin) has been appointed High School Visitor for the University of Colorado.

Dr. Thomas J. Kirby, Columbia University, formerly supervisor of industrial schools in New York City, has been elected professor of elementary education in the University of Pittsburgh.

C. A. Ruckmich (Ph.D., Cornell) has been appointed instructor in psychology at the University of Illinois, and Thomas Vance (Ph.D., University of Iowa) has been made assistant in psychology in that institution.

At Cornell University Dr. W. S. Foster (Ph.D., Cornell) and Mr. E. G. Boring have been made instructors in psychology, and Mr. D. Kennedy-Fraser (M.A., Edinburgh), recently Volunteer Assistant with Professor Meumann at Hamburg, has been made Assistant in Educational Psychology.

Dr. Frank P. Graves, of the Ohio State University, has been appointed professor of the history of education, and Dr. Harlan Updegraff, of Northwestern University, professor of educational administration at the University of Pennsylvania. Professor A. Duncan Yocum, who has occupied the chair of pedagogy at that institution, will continue as professor of educational research and practice.

A graduate school of education has been established at Bryn Mawr College. It is under the charge of Professor Kate Gordon, associate professor of education, Dr. Matilde Castro, director of the model school, and Professor James H. Leuba, professor of psychology. Professor Leuba will give a graduate course on the psychology of defective and unusual children.—*Science.*

William A. McKeever, professor of philosophy in the Kansas State Agricultural College, and author of the well-known Home Training Bulletins, has been appointed professor of child welfare in the University of Kansas, perhaps the first chair of the sort to be established in the United States.

PUBLICATIONS RECEIVED.

(*Notice in this section does not preclude a more extended review.*)

L'Année psychologique, fondée par Alfred Binet. Dix-huitième année (1912), publiée par Larguier des Bancels et le Dr. Th. Simon. Pp. 526. 15 fr.

It is reassuring to know that this important yearly volume will not perish though death has deprived psychology of the services of its founder, Alfred Binet. The 18th volume contains no summary of the literature, however, and in this respect differs markedly from its predecessors. Readers will find particular interest in the excellent likeness of Binet that forms the frontispiece and in the two articles descriptive of Binet and his work by the present editors. In addition, the volume has importance for educational psychology chiefly in the series of articles upon the Binet scale and other tests of the intelligence of children written by Bobertag, Goddard, Saffiotti, and others.

Kendric Charles Babcock. *Accredited Secondary Schools in the United States.* Bulletin No. 539. Washington: Bureau of Education, 1913. Pp. 65.

A brief discussion of the growth of high schools and of the definition of accredited school is followed by a detailed list of all accredited schools in the United States with their principals and their standing with such organizations as the North Central Association.

William Tenny Brewster. *Writing English Prose.* Home University Library. New York: Henry Holt & Co., 1913. Pp. 256. Fifty cents, net.

This is a treatise on style in English prose, and the principles laid down are copiously illustrated with examples from standard writers. Many of the illustrations show very clearly the types of expression to be avoided, as well as those to be imitated. It would be an excellent text for an advanced class in English.

L. Cellerier et L. Dugas. *L'Année Pédagogique. Deuxieme Année,* 1912. Paris: Felix Alcan, 1913. Pp. vii, 524. Fr. 7.50.

This valuable classified list of educational publications for last year contains 2721 titles. Every reference is annotated, so that the

work presents a reliable picture of current activity in educational discussions. Of the five original articles on general educational themes, that of L. Cellerier on "Education and the Will" is in many respects the most interesting.

Committee on School Lunches of the Home and School League. Second Annual Report. 1911-1912. Philadelphia: 1913. Pp. 31.

A detailed report on what is perhaps the most extensive experiment in school feeding in the country.

Concepts, Their Formation and Use. Fitchburg, Mass.: State Normal School, 1913. Pp. 28.

This little brochure was developed and issued by the Class of 1913 of the State Normal School at Fitchburg, Mass., and represents part of their regular work in psychology. In an introduction the class teacher, Mr. E. A. Kirkpatrick, explains that the study is similar to those of previous classes on Habit, Memory, Imagination and Attention, and that it represents the combined wisdom and best thought of the class as worked out by committees. The topics treated are "The Nature of Concepts," "The Formation of Concepts," "Judgment and Reasoning," "Teaching Children to Form Concepts," and "Teaching the Use of Concepts."

S. A. Courtis. *The Reliability of Single Measurements with Standard Tests.* Reprinted from Elementary School Teacher, Vol. 13: No. 7, March, 1913, and No. 10, June, 1913. 326-345, 486-504.

In these articles the author replies to the criticisms of Otis and Davidson on the reliability of a single trial of test No. 1 as a measure of ability in addition. The author claims that the test was there put to a use for which it was not intended, and hence undesirable results are not surprising. The agreement of the results in tests 1 to 4 with those obtained in test 7 is considered a good index of reliability. A careful study of the results of standard testing leads to the conclusion that "The basic factor in education is thus the fact of individual differences in natural ability, and the supreme problem of the future is the working out of administrative methods of dealing with large masses of children, yet at the same time giving to each child the special attention and the special courses it needs, without sacrificing the benefits of class work and group instruction. Only as the Courtis Tests aid in this "discovery of the individual" and the laws of his development will they have accomplished their purpose."

JULIA D. DRAGOUMIS. *Under Greek Skies.* (The Little Schoolmate Series.) New York: E. P. Dutton Co., 1913. Pp. xxi, 305. $1.00 net.

These delightful stories of children in modern Greece constitute excellent material for supplementary reading in elementary schools. They will be valuable in both geography and history. No child who reads about Mattina and Pavlo and Alexander can fail to have a vivid picture of modern Athens with its magnificent store of classic treasures.

Education in the South. Bulletin No. 540. Washington: Bureau of Education, 1913. Pp. 87.

Abstracts of papers read at the sixteenth Conference for Education in the South, held at Richmond, Va., April 15-18, 1913. Among the topics considered were co-operation, the rural problem, farm demonstration work, the country church, taxation reform, education of women in the country, problems of the rural school, training of teachers, high schools in the South, college extension work, the trend in negro education, and higher education of women.

GEORGE H. EDWARDS, JR. *The School as a Social Center.* Bulletin of the University of South Carolina, No. 35, Pt. II, Oct., 1913. Pp. 73.

A good summary of the Social Center movement, and a report on the progress of the movement in South Carolina. Perhaps the most valuable part of the bulletin is the 25 page bibliography.

HENRY PRATT FAIRCHILD. *Immigration: A World Movement and its American Significance.* New York: The Macmillan Company, 1913. Pp. xi, 455. $1.75 net.

The charge is frequently made that teachers as a class are woefully ignorant of current problems. The charge is probably false, for there are thousands of teachers who deliberately make of their class exercises occasions to train their pupils in rationally estimating the significance of current happenings. For such teachers, and for all thoughtful educators the present book will be of great value. It has been rightly said that the school is the great Americanizer. Both immigrants and native born Americans have recognized its value in training foreigners for American citizenship. Such service will be more intelligently rendered if teachers who come in contact with foreign born children will read and ponder over this scholarly discussion of immigration conditions.

CHRISTINE FREDERICK. *The New Housekeeping: Efficiency Studies in Home Management.* New York: Doubleday, Page & Co., 1913. Pp. xiv, 266. $1.00 net.

An intelligent effort to apply the new principles of industrial efficiency to that important and wide spread industry of housekeeping. It is already generally conceded that cooking and the elements of domestic economy should be introduced into the schools, but little thought has yet been given to fitting the kitchen with the best tools, arranging them in the most accessible manner, reducing the number of movements to a minimum, keeping proper records of income and outgo, and in general making the kitchen as efficient as the factory. Compared with Europeans we Americans are said to be a nation of wasters. There is no place to teach economy like the home. The development of economic and efficient methods of housekeeping is a task worthy the best thought of educators, and the present book consitutes a distinct contribution to the subject.

FUNK AND WAGNALLS' *New Standard Dictionary of the English Language.* New York: Funk & Wagnalls Company, 1913. Pp. xxxviii, 2916. $30.00.

This huge volume represents all that the latest developments in lexicography could offer, and that profuse expenditure of money could procure. The statement of the New York Sun that it is "The dearest single volume to produce in the world, and the cheapest to buy, considering its contents" is doubtless true. It has taken almost four years to prepare, over three hundred and eighty editors have been employed on it, and the total cost has been almost a million and a half. Points of excellence are: All words included in one alphabetical order, thus saving time, pronunciation keys at the top of the page so that they are easily read, rules for grammatical and rhetorical construction, correction of common errors of speech, inclusion of dialectical terms, special key for scientific pronunciation, antonyms as well as synonyms given, and all the latest terms in the arts and sciences edited by specialists. Review will follow.

HERBERT BRANSTON GRAY, D.D. *The Public Schools and the Empire.* London: Williams and Norgate, 1913. Pp. xx, 374, 6s net.

A thoughtful, well-balanced examination of the English public schools in their history and their present attitude toward the training of youth. The author has had thirty-five years' experience in English schools and has occupied educational positions of national importance. He regards "the existing condition of English education with anxiety, as being chaotic, inefficient, and ill suited to the temper

of the times and country in which we live. It is out of joint with the industrial needs of the times; it is too narrow for a country which aspires to keep intact the bonds of sympathy which tie the Overseas Dominions to the Motherland."

WINFIELD SCOTT HALL, PH.D., M.D. *Sexual Knowledge.* Philadelphia: International Bible House, 1913. Pp. 320. $1.00.

A much advertised book which sets forth in simple language the essential facts about sex. There is nothing novel in the treatment, but it is a straightforward, dignified account of the things which every person should know. The best authorities on individual and social hygiene are quoted, and the quacks that prey upon ignorance are painted in their true colors.

PAUL H. HANUS. *Report on the Educational Aspects of the Public School System of the City of New York. The Report as a Whole.* New York: Committee on School Inquiry, 1913. Pp. 93.

This discussion is valuable not only because it presents in condensed form a summary of the conclusions reached by each of the investigators in the New York City inquiry, but also because it embodies a survey of the whole field of modern urban education, and indicates standards and criteria of educational success.

ERNEST C. HARTWELL. *The Teaching of History.* Boston: Houghton Mifflin Co., 1913. Pp. viii, 71. Thirty five cents, net.

"The reader into whose hands this volume falls will be deeply interested in the ideals of teaching implied in the concrete suggestions given in the following pages, for after all the value of any system of special methods rests, not merely on its apparent and immediate psychological effectiveness, but also on the social purposes which it is devised to serve. It must be recognized at the outset that history has a social purpose."

FREDERICK L. HOLTZ. *Principles and Methods of Teaching Geography.* New York: The Macmillan Company, 1913. Pp. xii, 359. $1.10 net.

The author emphasizes the fact that while geography might be made, and ought to be made, one of the most interesting and fascinating of all school subjects, interest is all too frequently killed by a dull and dry presentation of isolated facts remote from the thought life of the pupils. How to so present the data of geography that it will stimulate and be adjusted to children's thinking is the theme of this book. The style is simple and attractive, and the suggestions for

reading, if followed out, will greatly enrich the resources of the geography teacher.

CHARLES H. JUDD. *List of Approved Colleges and Universities in the North Central Association of Colleges and Secondary Schools for 1913.* School Review Monographs, No. 4. Chicago: University of Chicago Press, 1913. Pp. 32. Twenty five cents, net.

An interesting discussion of the criteria of approval, the control and organization of approved institutions, admissions, registration, degrees, graduate study, preparatory departments, size of college classes, hours of instruction, training and salaries of the faculty, and material equipment.

GEORG KERSCHENSTEINER. *The Idea of the Industrial School.* Translated from the German by Rudolf Pintner. New York: The Macmillan Company, 1913. Pp. xi, 110. Fifty cents, net.

In this little book the foremost authority on industrial education in the world sets forth his ideas as to the purpose and duties of the public schools. These duties are (1) preparation for a vocation, (2) teaching the ethical value of a vocation, (3) teaching the ethical value of the community within which the vocation is carried out. An appendix gives an account of the organization of industrial training in the elementary schools of Munich.

C. LEVADITI, A. MARIE ET J. BANKOWSKI. *Le tréponème dans le cerveau des paralytiques généraux.* Reprinted from Annales de l'Institut Pasteur, Vol. 27: No. 7, July, 1913. Pp. 20.

The authors confirm the discovery of the spirochete of syphilis in the brains of those who have shown the symptoms of general paralysis, and present evidence to prove that this mental disease is due to the gradual destruction of the neural tissue by the micro-organism indicated.

P. M. MAGNUSSON, PH.D. *Psychology as Applied to Education.* New York: Silver, Burdett & Co., 1913. Pp. ix, 345.

In this day of experimental pedagogy and the scientific study of educational problems in and of themselves one is inclined to look askance at the effort to apply psychology to education. Nor does one find any echo of experimental study in this book. What one does find is a series of simple, easy, plain, talks, somewhat after the manner of James, grouped largely under the topics of formal psychology. With this aim in mind it must be admitted that the author has

acquitted himself well of his task, and that the young student will find much in the book that will stimulate his thought and give him a better attitude toward his work. The exercises at the end of each chapter evince much originality, and constitute one of the distinctive features of the book.

EUGÈNE MARTIN. *Psychologie de la volonté.* Paris: Felix Alcan, 1913. Pp. iv, 176. Fr. 2.50.

If one accepts Angell's definition of will as "The whole mind active," then any psychology of the will resolves itself into a general psychology with emphasis upon action. Now action is a blanket term covering the most varied types of response to situations, and as the scientific way of approaching the subject would be to experimentally explore as many typical responses as possible, and draw conclusions from the results obtained. This laborious method of procedure does not commend itself to the French mind, however, and Professor Martin goes merrily on with his theoretical analysis, quite oblivious of the work of Ach and the Würzburg school. His reflections are based largely on the psychology of Kant, Herbart, Spencer, Ribot, and James.

Medical Inspection of Schools in Philadelphia. Reprinted from the Annual Report of the Department of Public Health and Charities for the Year 1912. Philadelphia: 1913. Pp. 116.

Includes the report of the inspector for parochial and private schools, of the eye dispensary, of the dental dispensary, and of the director of medical inspection of the public schools. A sixteen page insert of graphs, charts, etc., shows exactly how the reports are made, presents the results in graphic form, and adds very materially to the value of the discussion.

E. MEUMANN. *The Psychology of Learning. An Experimental Investigation of the Economy and Technique of Memory.* Translated from the third German edition by John Wallace Baird. New York: D. Appleton & Co., 1913. Pp. xix, 393.

The little one hundred page pamphlet "Ueber Oekonomie und Technik des Lernens" of 1903 has grown in subsequent editions to the ample volume which, thanks to Dr. Baird, is now made accessible to English readers. This growth in size is paralleled by a corresponding growth in scope, and the book in its present form constitutes a fairly complete psychology and pedagogy of memory. The intent of the author is best indicated by quoting from Professor Meumann's preface to the American edition. "It is the aim of the present monograph to meet this urgent demand for methods of learn-

ing which shall be psychologically most appropriate, and which shall embrace all of the different kinds of learning. It begins with methodical observation as the basis of all memorial work. It seeks to develop rules for systematic observation. It discusses the most favorable subjective and objective conditions for mechanical memorization; and it endeavors to establish at least a few of the cardinal points for the retention of logical associations.—a process whose nature is still imperfectly known. Our present knowledge of the economy and technique of learning is still in need of being supplemented by practical instructions as to how best to master the various concrete tasks with which the pupil is daily concerned."

E. Meumann. *Vorlesungen zur Einführung in die experimentelle Pädagogik und ihre psychologischen Grundlagen.* Zweiter Band. Zweite umgearbeitete und vermehrte Auflage. Leipzig: Wilhelm Englemann, 1913. Pp. xiv, 800. M. 11. Geb. M. 12.15.

The second volume of this encyclopedic masterpiece of Professor Meumann's fully sustains the reputation for thoroughness and inclusiveness made by the first. The volume deals with individual psychology as a basis for pedagogy, and devotes much space to summarizing the tremendous output of literature in the past few years on the experimental study of capacities and on tests of intelligence. Almost two hundred pages are given to the discussion of the Binet tests alone. A further one hundred and eighty pages present the methods and results of other investigators of capacities, as Rossolimo, Spearman, Thorndike, Whipple, Goddard, Sharp, Wreschner, Stern, Bobertag, Pohlmann, Burt, and Meumann himself. The twelfth lecture sums up the net results of all these studies of individual differences in capacity, requiring two hundred pages for the summary, and lecture thirteen closes the volume with one hundred pages on the practical problems involved in these studies of intelligence. Professor Meumann is one of the most catholic of German writers in his evaluation of the contributions of American, English and French experimenters. He shows his thorough mastery of the whole field, and approaches his task in a truly international spirit. His work is therefore a mine of information on current activities in the field of experimental education. The third volume will deal with experimental studies of the teaching process.

Maria Montessori. *Pedagogical Anthropology.* Translated from the Italian by Frederic Taber Cooper. New York: Frederick A. Stokes, 1913. Pp. xi, 508. $3.50 net.

There is a growing recognition of the claim that pedagogical theory must be rooted in biology and anthropology, and must de-

velop in the atmosphere of social needs. It is fortunate for the wider spread of this idea that the leader of what promises to be a veritable cult in primary education has published a work on the application of anthropological studies to education, and that this work is now offered to English readers. It is indeed an imposing volume, replete with tables, diagrams, and plates, and in its American dress reflects much credit on its publishers. The ten chapters deal with principles of general biology, craniology, the thorax, the pelvis, the limbs, the skin and pigments, technical procedure, statistical methodology, the biographic history of the pupil and his antecedents, and the application of biometry to anthropology. While much of the material deals with adult rather than child anthropology, this only serves to emphasize the need for more extensive data on the physical development of children. The book is a useful contribution to pedagogical literature, and we congratulate the translator and the publishers on its production in English.

Louise Montgomery. *The American Girl in the Stockyards District.* Chicago: The University of Chicago Press, 1913. Pp. 70. Twenty five cents.

This investigation, carried on under the direction of the Board of the University of Chicago Settlement and the Chicago Alumnae Club of the University of Chicago, deals with the educational standards of the community, the local schools, the girl as a wage-earning child, the working girl, and problems of adjustment.

H. N. Morse, E. Fred Eastman and A. C. Monahan. *An Educational Survey of a Suburban and Rural County, Montgomery County, Md.* Bulletin No. 542. Washington: Bureau of Education, 1913. Pp. 68.

Among the recommendations made are more assistant superintendents, thus securing better supervision, reorganization of the course of study, and reduction of the number of schools by consolidation and concentration.

The Newton Public Schools. What they are trying to do and with what success. Annual Report of the School Committee, Newton, Mass. Vol. 74, 1912.

Superintendent Spaulding's report contains not only complete tables and charts, but forceful preachments on educational policy, and an artistic plan for setting forth the salient points which he wishes to emphasize.

FRANCIS W. PARKER SCHOOL YEAR BOOK. *The Morning Exercise as a Socializing Influence.* Chicago: Francis W. Parker School, 1913. Pp. 198. Thirty five cents.

The selections presented include exercises showing types of preparation, exercises reported verbatim, exercises emphasizing school unity and school policies, exercises for special days, and miscellaneous exercises. A valuable adjunct is a classified list of morning exercises.

HOMER H. SEERLEY. *The Country School.* New York: Charles Scribner's Sons, 1913. Pp. xx, 218. $1.00.

Practical advice to country school teachers by one who was raised on a farm and who has spent twenty five years of his life training country boys and girls to teach school. The discussion includes a consideration of the relation between the school and the community, the organization of school and community, the course of study, management and government of the school, program and course of study, standardization, agriculture, and the supply of teachers. Out of the abundance of his experience the author has much to say that will be helpful to the country school teacher.

J. F. SHEPARD AND F. S. BREED. *Maturation and Use in the Development of an Instinct.* Reprinted from the Journal of Animal Behavior. Vol. 3: No. 4, July, 1913. 274-285.

Is the improvement in the pecking reaction of chicks due to practice or to the increasing maturity of the organism? Chicks kept from pecking for three, four, and five days after hatching (being kept in a dark room and fed artificially) showed very poor results on the first two days. After that the improvement was about normal. A certain amount of practice is necessary but in delayed pecking a limited amount of practice carries with it an exceptionally rapid improvement. The most of the ordinary improvement thus seems due to maturation.

SUSAN B. SIPE. *Good Roads Arbor Day.* Bulletin No. 536. Washington: Bureau of Education, 1913. Pp. 29.

"The material in this pamphlet is about equally divided between good roads and tree planting. The people must be educated on the subject of roads before much tree planting can be done."

Special Features in City School Systems. Bulletin No. 541. Washington: Bureau of Education, 1913. Pp. 61.

A tabulation of replies from school superintendents describing plans or methods they had worked out in their schools during the past few years.

ALVA WALKER STAMPER. *A Textbook on the Teaching of Arithmetic.* New York: The American Book Co., 1913. Pp. 284. $1.00.

The book gives an interesting history of the subject; an account of the reasoning involved in arithmetic, in which are discussed the logical types and the application of induction and deduction to various kinds of problems; a brief treatment of the scope and value of algebra and geometry in the elementary school; and a general lesson plan, with ten plans worked out in detail giving advice as to modes of instruction and detail of routine work.

ARTHUR H. SUTHERLAND. *Critique of Word Association Reactions. An Experimental Study.* Published by the author, University of Illinois, 1913. Pp. 46.

The reasons for delayed reaction or failure to react are many, and vary with individuals. The Freud School is certainly in error in assuming that such inhibitions are due to sex traumata alone.

ARTHUR JAMES TODD. *The Primitive Family as an Educational Agency.* New York: G. P. Putnam's Sons, 1913. Pp. x, 241.

The author, who is a member of the department of sociology in the University of Illinois, has had two classes of students in mind: Those who desire an outline sketch of the early evolution of the family, and those who feel the lack of materials illustrating methods and organization of primitive education. It is in the educational aspect of the inquiry that the author himself is most interested. The educational question takes the following form: "If the family has heretofore been the basic educational agency but is losing its educational efficiency, can we devise a more adequate type of education with other social institutions predominant in its foundations?" The result is an interesting and thought-provoking book which develops some rather novel points of view.

MAX VERWORN. *Irritability. A Physiological Analysis of the General Effect of Stimuli in Living Substances.* New Haven: Yale University Press, 1913. Pp. xii, 264. $3.50 net.

Once again the student of behavior is placed under obligation to the directors of the Silliman Memorial Lectures at Yale University

for a comprehensive presentation of recent investigations on the responses of living substance. Six years ago Sherrington delivered his lectures on the Intergrative Action of the Nervous System,—a work which has formed the basis of all discussions of the reflex arc since that time, and which has furnished the central principle for at least one modern textbook on psychology (Pillsbury). Now Professor Verworn, the greatest living authority on general physiology, has welcomed the opportunity afforded by the University's invitation to summarize "the results of numerous experimental researches carried out in the physiological laboratories of Jena, Göttingen, and Bonn, to unite therewith the results obtained by other investigators, and thus to present a uniform exposition of the general effects and laws of stimulation in the living substance." Some of the chapter headings are the history of the subject, the nature of stimulation, characteristics of stimuli, general effect of stimulation, process of excitation, conductivity, refractory period and fatigue, interference of excitations, and processes of depression.

W. H. Winch. *Inductive versus Deductive Methods of Teaching: An Experimental Research.* Educational Psychology Monographs, No. 11. Baltimore: Warwick & York, 1913. Pp. 146. $1.25.

Which method gives the best results in teaching geometrical definitions, induction or deduction? Experimental investigation in five schools showed that where exact reproduction is required the deductive method works best with the younger pupils and the inductive method with the older ones. When tested by their ability to apply themselves to new material those who had been taught inductively did better in every case than those taught deductively. Tests of deferred reproduction showed some slight advantage in favor of inductive teaching, but not enough to surpass the results of deductive teaching with young pupils.

Robert M. Yerkes, A.M., Ph.D., and Daniel W. La Rue, A.M., Ph.D. *Outline of a Study of the Self.* Cambridge, Mass.: Harvard University Press, 1913. Pp. 24. $1.00.

This is an extremely interesting undertaking along the line of Stern's psychographie. The outline is bound in loose-leaf form, so that additional sheets containing personal records may be inserted at will in their appropriate places. The outline includes (1) the ancestral history of the self, (2) the development or growth of the self, (3) the self of today, and (4) the significance of the characteristics of the self. Each of these topics is subjected to a minute analysis, and detailed questions and instructions are given for filling out the record on each point. In the ancestral history the elaborate

"Record of Family Traits" from the Eugenics Record Office of the Carnegie Institution is incorporated in the outline, and under the marital relations in the last section the still more elaborate "Index to the Germ-Plasm" from the same institution is included. The authors state that "The purpose of this study is threefold: first, to help you to understand yourself and to become a useful and happy member of society; second, to help you to understand and sympathize with other persons, especially children, and to further their development; third, to arouse your interest in the facts of heredity, of environmental influence, and in the significance of the applied sciences of eugenics and euthenics." The outline is still in tentative form, and the authors would be glad to have psychologists and educators fill it out and criticize the plan.

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PRELIMINARY STUDY OF THE EFFECT OF DENTAL TREATMENT UPON THE PHYSICAL AND MENTAL EFFICIENCY OF SCHOOL CHILDREN.

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INTRODUCTORY.

Studies concerning the loss of efficiency due to defective vision, impaired hearing, presence of adenoids, etc., have been made by Dr. Leonard Ayres, Dr. Walter C. Cornell and others. Last year Dr. J. E. Wallin made an attempt to "measure the relation between community mouth hygiene and intellectual efficiency of elementary school-children." This work was done in the city of Cleveland, and very promising results were claimed. The weak point in the work there, as is conceded by the experimenter, is the fact that only the class of children receiving dental attention was tested, thus giving no opportunity for comparison with other children not receiving treatment. The present paper is a first attempt to trace the effect of dental treatment with proper check-tests of non-treated children.

THE METHOD.

Two fifth grade classes in the same down-town school were selected for the purpose of comparison. The classes were as evenly graded as is possible in ordinary school classification. Both were so-called German-English classes; that is, each gave a part of the day to the study of the German language. The

children came from the same neighborhood, so that home and social conditions were largely the same. A census showed that in one class (Room 21) there were 16 children who were themselves foreign born and whose parents were foreign born, while 13 children were American born with foreign born parents. In the other class (Room 18) 21 children were foreign born with parents of foreign birth, and 13 were American born with foreign born parents. In all but three of the above cases the places of birth were Russia, Austria, Servia and Hungary. The home conditions were thus more than usually of like kind.

The choice of the experimental class was decided by the toss of a coin. Room 21 was chosen. The classes were about equal in numbers, starting out exactly so, and the proportion of boys and girls in each was the same.

Room 21 received all the care that dental science could give, including treatment, tooth-brush drills, dinners to afford opportunity to teach proper mastication, etc. The other class received only such attention as they sought, which was found to be practically none. A nurse and social visitor followed all experimental cases and saw that instructions were carefully heeded.

The Tests in Detail.

The physical tests included weight and height standing, and were made by the physical director of the school. All other tests were given by the same two experimenters, each taking certain ones.

The Psycho-physical Test. Here we used the Tapping Test (Test 10, Whipple's *Manual*); a tapping board with brass plates, a tapping stylus and a recording instrument, which showed the number of contacts made, were used. By means of a stop-watch the number of contacts was read at the end of each 15 seconds. The test for each hand extended over a period of one minute. The experimenter explained the manner of procedure by going partly through the test. The subject was then placed in position and given a few seconds' practice, followed by a rest. It was insisted that all movement be from the wrist, so as to secure more uniformity. At the beginning the subject was urged to do his best, but nothing was said during the work.

The Psychological Tests. I. The "A" Test (Whipple's Test 26). This is the familiar Cancellation Test. The subject is given a sheet of paper on which the letters of the alphabet appear in chance order and is told to cross out all of a certain letter as quickly as possible, line by line, without going back for corrections or omissions. On the sheet used each letter appeared 50 times. This test was given to a group, half the class being taken at a time and distributed through the room to avoid copying. A sample copy was explained from the blackboard, after which the test papers were placed on the desks, face down. Each child wrote his name on this reverse side. At an agreed signal, the papers were turned from left to right and work begun. A warning was given in advance not to sacrifice accuracy for speed. The time allowed was 150 seconds, and all hands were clasped on the heads at the close of the exercise while the papers were collected.

In May a similar sheet was used, but the letter crossed was "m."

II. The Rote Memory Tests. We used the Memory Span Method (Whipple's Test 38), by the group method. The test was explained by the use of a card on which appeared five discrete digits. A metronome was set at 60, and the class allowed to catch the rhythm. The card was then exposed and the class read the digits aloud, in time with the metronome beats. At the signal the digits were written on paper provided for the purpose. Attention had been called to the importance of recording the digits in the original order. After this practice, two cards each of 6, 7, and 8 digits were exposed and the papers collected as before.

III. The Learning Test. Substitution (Whipple's Test 37). This test seeks to measure the rapidity with which associations are formed by repetition. A piece of cardboard on which were printed nine simple geometrical forms (square, triangle, etc.) with an inscribed digit in each was used as a "key." This key was presented to the subject in connection with four sheets of paper each containing ten lines, five of the above symbols, arranged by chance, to each line and without the inscribed digits. The subject was requested to inscribe the proper digits, line by line. He was allowed to use the key for

the first three sheets, but not for the last one. Each line as completed was covered by the experimenter.

In the tests given in May the same symbols were used, save that different digits were assigned to them; moreover several different keys were put in use at the same time, and the children were informed of this, so that there might be no temptation to communicate when they returned to their classrooms.

The Results.

In all the figures given below, the median is used rather than the more common average, as it gives the central tendency of the class and neutralizes the effect of extremes at either end.

Only such children as were present in both groups of tests are counted; otherwise there has been no selection.

I. Weight.

Physical Tests.	*Oct.*	*May.*	*Gain.*
Room 18. 38 cases	67.5 lbs.	76.5	9.
Room 21. 40 cases	67.25 lbs.	73.	5.75

Here we find that while the median for the two classes was almost identical, in October Room 18 leads in gain by 3.25 lbs.

II. Height Standing.

Physical Tests.	*Oct.*	*May.*	*Gain.*
Room 18. 39 cases	53.2 in.	56.1	2.9
Room 21. 40 cases	53.5 in.	56.	2.5

The measurements here show no appreciable difference.

The Psycho-physical Test. In evaluating the results of this test we have taken into account the actual number of taps at each trial (marked "total"), and also the "fatigue element." The *fatigue index* is a per cent, which shows the ratio between the decrease in the number of taps during the last 15 seconds and the total number in the first 15 seconds (the tapping continued 60 seconds in all.) Results are given for each hand, one trial each. It will be noted that the total number of taps is significant, since it is likely that the fatigue-index will be less when the initial total is small. For example: Subject S. L. has the following record: 77-75-73-73; total 298; fatigue index 0.051.

Subject J. G. has the following record: 111-101-103-87; total 402; fatigue index 0.216.

Here, Subject S. L., with an initial speed of 77 taps, has a

fatigue index of only 5%, while Subject J. G., with 111 taps, has an index of 21%; yet the latter, with his total of 402 taps, has surely the better record, especially since the taps in the last 15 seconds exceed by 10 taps those of the first 15 seconds in the other subject's record.

Right Hand, Total Taps.	*Oct.*	*May.*	*Gain.*
Room 18. 41 cases	295	308	13.
Room 21. 41 cases	304	312	8.

Room 21 leads in both tests by 9 and 4 taps respectively.

Left Hand, Total Taps.	*Oct.*	*May.*	*Gain.*
Room 18	242	253	11.
Room 21	243	255	12.

Room 21 leads in both tests by 1 and 2 taps, respectively.

In computing the fatigue-index we found that sometimes there were more taps in the last than in the first 15-second period, which shows lack of proper effort on the part of the subject. There were 4 such cases in Room 18 and 1 in Room 21.

Fatigue-index, Right Hand.	*Oct.*	*May.*	*Gain.*
Room 18. 41 cases	15.2%	13.1%	2.1%
Room 18. 41 cases, without minus cases	14.5%	13.3%	1.2%
Room 21. 41 cases	17. %	12.5%	4.5%
Room 21. 41 cases, without minus cases	17. %	12.5%	4.5%

Although Room 21 shows greater fatigue in the first test by 1.8%, it shows less by .6% the second time, thus placing its endurance in the lead by 2.4%.

Fatigue-index, Left Hand.	*Oct.*	*May.*	*Gain.*
Room 18. 41 cases	15.1%	14. %	1.1%
Room 18. 41 cases, without minus cases	15.0%	13.6%	1.4%
Room 21. 42 cases	17.5%	13.5%	4. %
Room 21. 42 cases, without minus cases	17.5%	13.3%	4.2%

As with the right hand, although Room 21 shows greater fatigue in the early test, it shows .5% less in the second, and thus shows a gain in endurance of 2.9% over Room 18. As pointed out above, the fact that Room 21 leads in every case in total number of taps makes the lead in endurance the more conspicuous.

Psychical Tests. I. The Cancellation Test.

This is a test in perception, and is scored by the number of letters cancelled in a fixed time. In this case the time was 2½ minutes. The results are given in simple percents, which indicate the accuracy of the performance; the time is constant.

Cancellation Test.	*Oct.*	*May.*	*Gain.*
Room 18. 40 cases	61 %	84 %	23%
Room 21. 37 cases	56.5%	74.5%	18%

Here Room 18 takes the lead; 5% in the lead in the beginning, it gains in the second test, making a total gain of 5% more than that of Room 21.

In looking over the individual records we find that the time-limit seemed to interfere greatly in Room 21. The work done there is accurate, but in most cases the papers were unfinished when time was called and the score was thus reduced, as it was based on the crossing out of the complete number of "a's."

II. The Rote Memory Test.—The evaluation of results is again in percents, credit being given both for the reproduction of the digits and for the order of their reproduction. Two cards of each series were used, and the average of the two results is taken in the table. A correct digit properly placed received 4; if one place removed from the proper place it received 2; no other credit is given, except in case of a series of three digits in correct succession but wrongly placed, when only the first of the series lost its credit. In this way, when there were six digits in the series, 24 represented a perfect record of 100%, and others were calculated accordingly.

Rote Memory, Six Digit Series.	*Oct.*	*May.*	*Gain.*
Room 18. 40 cases.	87.5%	96.6%	9.1%
Room 21. 38 cases.	91.6%	100 %	8.4%

Room 21 leads at the beginning by 4.1% and at the second test by 3.4%. Its median of 100% makes it impossible to show a greater gain. This is evidently too easy a test for children of this age.

Rote Memory, Seven Digit Series.	*Oct.*	*May.*	*Gain.*
Room 18.	71.4%	71.4%	0 %
Room 21.	74.9%	85.7%	10.8%

Room 21 leads at the beginning by 3.5% and by 14.3% in the second group, finishing with a gain of 10.8% over its first record as against no gain in the other class.

Rote Memory, Eight Digit Series.	*Oct.*	*May.*	*Gain.*
Room 18.	56.3%	62.5%	6.2%
Room 21.	59.3%	65.6%	6.3%

Room 21 leads in the first group by 3%, in the second by 3.1% and in gain by .1%. We here reach the limit of memory span for this age and the possibility of gain is therefore less.

III. The Learning Test. Substitution.

The results are based on the percents in accuracy and time in seconds and represent the amount of time necessary to approximate 100% in accuracy. There are 50 symbols on a page; each one correctly inscribed receives 2. The time, in seconds, taken for the work is noted. The index of efficiency is then obtained by dividing the time thus expressed by the per cent of accuracy. By multiplying this index by 100 we get the amount of time needed to approximate 100%. For example:

Subject I. J. shows the following record for the first sheet:

Time.	*% of Accuracy.*	*Index of Eff.*
186.4″	96%	1.941

Multiplying the index by 100 we find it would take this subject 194.1 sec. to approximate 100%. The tables below give the results for the first and last sheets only as they alone are necessary to calculate the learning power.

Substitution, Sheet I.	*Oct.*	*May.*	*Gain.*
Room 18. 43 cases.	201.6″	172″	29.6″
Room 21. 38 cases.	206.5″	183″	23.5″

As indicated above, the figures show that in the first test Room 18 needed 201.6″ to reach a perfect record in the first, and 172″ in the later test. Similarly, Room 21 needed 206.5″ in the first and 183″ in the second test. Room 18 shows the better record.

Substitution, Sheet IV.	*Oct.*	*May.*	*Gain.*
Room 18. 43 cases.	118.8″	110.5″	8.3″
Room 21. 38 cases.	127.4″	104.9″	22.5″

It will be remembered that in Sheet IV the work was done without reference to the key, and thus indicates the learning power.

In this test Room 18 needs 118.5″ in the first, 110.5″ in the second trial, making a gain of 8.3″. Room 21, although needing 127.4″ in the first trial, reduces this to 104.9″, making a gain of 22.5″.

The real values in the above test are shown in the next table which gives the "learning power;" *i. e.*, the saving in time between that needed for the first sheet the first time and that needed for the last sheet the last time.

Learning Power.	*Sheet I, 1st time.*	*Sheet IV, last time.*	*Gain.*
Room 18.	201.6″	110.5″	91.1″
Room 21.	206.5″	104.9″	101.6″

Room 21 leads, with a learning power expressed by a saving of 101.6″, compared with 91.1″ in Room 18.

Conclusions.

In summarizing we find that there is a decided lead taken by the Experimental Class. This holds true in all but one of the psychological tests. The improvement in appearance and deportment in the experimental class has been marked by the numerous educational and social workers who have visited the school during the year. To make the comparisons more valid we have planned to follow these classes for another year, submitting each to a new series of tests at the beginning and close of the school year. The disturbing factor introduced by the actual carrying on of the dental work in the experimental class, which we feel was to a degree adversely involved this year, will be slight, since the original timidity has been overcome and but little treatment will be needed to keep up the present good oral conditions.

In the following tabulation we have sought to show at a glance which group led, on the average for each test, save the physical, both before and after the dental treatment:

	Room showing net superiority	
Test.	*Before dental treatment.*	*After dental treatment.*
Total taps, right hand	21	21
Total taps, left hand	21	21
Endurance, tapping, right hand	18	21
Endurance, tapping, left hand	18	21
Rote memory, 6 digits	21	21
Rote memory, 7 digits	21	21
Rote memory, 8 digits	21	21
Cancellation	18	18
Substitution	18	21
Learning	18	21

In all, then, Room 18 led five times out of a possible ten when the tests were given first, so that its ability would seem to be equal with that of the treated class. After dental treatment of its competitor, Room 18 leads but once, while Room 21 maintains its previous lead in five tests and gains the lead in four of the five remaining tests, finishing with a total of nine out of a possible ten.

EXPERIMENTAL RESEARCHES ON LEARNING TO SPELL.

By W. H. Winch.

London, England.

(*Concluded from the November Number.*)

Part II.

V. A Second Experiment, with Standard IV. Boys.

Average Age 11 years 0 months.

i. *The Boys who did the Work, and why it was done with older Boys.*

In the first experiment we found that, with boys who were young and mentally undeveloped, a method of learning spelling, which, with attention directed by the experimenter, possessed marked articulatory and auditory factors as well as visual ones, was superior in results to a method in which the boys worked silently by themselves, and therefore apprehended the sequence of the letters mainly by visual means. I say *mainly* by visual means, since, as a matter of fact, the boys also muttered the words and letters as they were learning them. With young children of an undeveloped type it is practically impossible to prevent this. So that it might fairly be argued that by *both* methods the children really employed articulatory and auditory factors, as well as visual ones. But older boys can really work silently, or at least, much more so. Perhaps *really* silent visual work would be more efficacious than simultaneous work by a combined method. To test this hypothesis a similar experiment was carried out with the boys of Standard IV[1]—the highest class in this school which contains, as an American would say, the primary, but not the grammar grades. As before, the boys who did the work were exclusively the children of Jewish aliens.

[1]This Standard corresponds to Grade V in America and to the Fifth School Year in Germany.

ii. *The Lists of Words of Equal Difficulty.*

Two sets of words were selected, 30 in each set, from a small dictionary called *'Green's Dictionary of Selected Words, being the words added to a Scholar's Vocabulary in the Upper Standards of an Elementary School.'* The title is unduly hopeful, and I am not prepared to advocate that every one of the words in these lists should be known by all elementary pupils; but that non-advocacy will in no way invalidate the conclusions of our experiments. The following words were picked out:

The List of Words called Set A.		*The List of Words called Set B.*	
aborigines	exchequer	accomplice	excavate
acrobat	extinguish	acquit	extravagant
advertisement	disease	apprentice	eccentric
aeronaut	eclipse	aggravate	economy
alibi	committee	almanac	complexion
amateur	conciliate	ambassador	conceal
analyze	congestion	annuity	conjurer
apostrophe	conscience	apparition	convalescent
apprehend	convulsion	archipelago	correspond
arsenal	corroborate	artificer	crucible
asphalt	denominator	auxiliary	deteriorate
bachelor	destitute	bazaar	dislocate
blaspheme	dispensary	bronchitis	discipline
campaign	duplicate	carnivorous	ecclesiastic
chronometer	effervesce	chrysalis	encyclopedia

I print these lists, since they have been tested and found equal, for one class at least; and they may be useful to other experimenters.

iii. *How the Test Words were Administered.*

They were called out by the experimenter—the Head Master, as before—each word once, and then written down, one by one, in small hand, by the boys taking part in the experiment. Words from Set A and Set B were called out alternately, one from Set A and then one from Set B, and so on. They were dictated at 2.15 p. m., after the second Registration on Monday, February 17th, the exercise taking 25 minutes. For the present I ask the reader to accept the equality in difficulty of the two sets of words—the detailed results will be given later.

iv. *The Chronology of the Teaching Practice for Set A and Set B.*

Each lesson lasted 10 minutes, and commenced either at 9.45 in the mornings, after Scripture lesson, or at 2.05 in the afternoons, after the first Registration. The words of Set A were learnt on the Tuesday morning following the preliminary test, on Wednesday afternoon, and on Thursday morning. Those of Set B were learnt on Tuesday afternoon, on Wednesday morning, and on Thursday afternoon. East set of words, therefore, received three practice periods of 10 minutes each. Set A probably has a slight advantage in point of time for work of this kind; though, for work employing what are usually called the 'higher mental functions,' the early afternoon is probably better. But if any advantage exists, it is certainly a very slight one.

v. *The Two Methods Employed, one for Set A, the other for Set B.*

The method for Set A was precisely the same as that employed for Set A in the previous experiment in the same school; it was a combined method with directed attention. For Set B the method was, as before, a visual method without directed attention. All the testing and teaching were done by the same man throughout—the Head Master of the school. This is important with experimental work with children, since, to alter your experimenter as well as your method, is to run grave risks that a new factor, producing variation, may come in, to wit, the disciplinary influence of the experimenter. Sometimes this risk must be taken, but it should be avoided if possible. The reader is requested to refer to the account of the previous experiment for a psychological analysis of the two methods: these boys did not mutter; the method for Set B was, therefore, really visual, and visual only.

vi. *The Final Tests with Set A and Set B.*

On Monday, at 2.05 p. m., the two Lists of Words were dictated, word by word, one word from each set alternately. Set B, therefore, in the final testing, had the slight advantage of a more habitual time to set against the slight advantage of the larger number of *morning* lessons accredited to Set A.

vii. *The Results in* (*a*) *The Preliminary Tests,* (*b*) *The Final Tests.*

The complete results for each individual were tabulated and entered on a schedule. I suggest the general utility of such schedules in experimental pedagogy; they will save us from many hasty conclusions, and are of enormous interest to the teachers. Give a teacher such a schedule, with marks that he can understand, set out for the boys he knows (the psychologist doesn't, let us remember) and he will thank you and ask you to do some more work in his school. The teachers who know the boys will discuss the results most eagerly; they will tell you that you are wrong in certain cases—you probably are—but that will not prevent them (and they know, if anyone does, the variability of school-children) from frankly accepting the general results of the experiment, if they are set out in a form which they understand. The more sophisticated teachers are suspicious of mathematical calculations: the superior person, arguing from data by methods they do not know, will *never* convince *them.* I am not prepared wholly to condemn their attitude: I like to see individual results myself.

Table III, showing how the Individual Results were tabulated.

Name.	Tests before Learning Number of Words Correct. Set A.	Set B.	Tests after Learning Number of Words Correct. Set A.	Set B.
M. Marks	15	15	28	26
A. Dorin	13	10	24	19
.....	..	..	..	..
A. Roth	9	11	30	27
.....	..	..	..	..
P. Müller	7	6	24	24
.....	..	..	..	..
H. Ritts	3	3	23	22
S. Altman	3	3	24	19
.....	..	..	..	..
M. Serkner	0	0	1	1
.....	..	..	..	..
H. Woolfstein	0	0	12	5
54 boys. Averages	4.3	4.4	17.9	15.1

Comments on Table III.

Apparently the words for Set A and Set B were well chosen: they are equally well done *before* learning. There has been enormous improvement *after* learning: and reference to the full schedule of results shows that there are only three cases

in which the improvement by the method employed for Set B is greater than that resulting from the method employed for Set A. A grouped correlation table follows.

Table IV., showing, section by section, the Number of Words Spelt Correctly before Learning and after Learning.

Number of Words of Set A Correct before learning.	No. of boys.	Before Learning. Average number right.		After Learning. Average number right.	
		Set A.	Set B.	Set A.	Set B.
Over 10.	3	13.0	12.0	26.3	24.3
9, 8.	8	8.5	8.5	24.5	22.7
7, 6.	8	6.9	7.1	22.4	18.4
5, 4, 3	14	4.0	4.6	21.4	16.4
2, 1.	10	1.6	2.6	12.3	11.5
0.	11	0.0	0.3	8.7	6.7

Comments on Table IV.

These are evidently not 'chance' results. All along the line, for the weaker pupils as well as for the abler ones, the simultaneous combined method with attention directed by the experimenter has shown itself victorious. To the statistician the result emerges quite as readily and more succinctly from the figures given in the following section:

viii. *Statistical Evaluation of the Result.*

The average number of words correctly spelt in Set A *before* learning was 4.3, for Set B it was 4.4. The correlation coefficient between the results of Set A and Set B was +.81, and the 'probable error' of the difference between the averages was .20. There is, therefore, no 'significant' difference between the two lists before learning.

After learning, the averages were, for Set A, 17.9, and for Set B, 15.1: the correlation-coefficient was +.89, and the 'probable error' of the difference between the averages was .34. The difference between the means, namely, 2.8, is 8 times its 'probable error,' and is therefore a highly 'significant' difference.

ix. *Conclusions from the Second Experiment.*

It was suggested that the presence of slight articulatory and auditory factors in the method used for Set B *might* have lessened somewhat the results by this method with the young children of Standard II. On the other hand it was also sug-

gested that a purely visual method might have a better chance with older children. So far, all that we can say is that with these older boys—about 2⅓ years older—the result is in the same direction as with the younger children, but even more decided. The combined method has again won the victory. But, for there is a but, I am not yet convinced that for all elementary school children the combined method is the best. These boys are still young in years—about 11—and are certainly not of a highly developed type; and we must try the experiment in other schools of a different character. Still, for boys of this age and development, there is no doubt about the results; they are conclusive. But let us bear in mind that for Set B the attention of the boys was not directed, and for Set A it was. The difference may lie there, and not in the combination of motor, auditory and visual memories. But under the conditions given—a method actually in use in schools—the 'combined' method proves to be distinctly superior.

VI. Subsidiary Experiments with Standard I. Boys.

Average age 7 years 0 months.

i. *How the Experiment came into Being.*

I call these exercises now to be described *subsidiary* experiments, though they were more numerous and extended over a much longer period than those which have previously been recounted. But they are really subsidiary in two respects. First of all, they preceded these experiments in time, and secondly, there were imperfections in them, considered experimentally, which render them less conclusive; though, as I have said, they were much more numerous and much more protracted. But collectively they have some value; and they are interesting as showing, in one actual case, how a principal, just appointed to a school, set about trying to improve the spelling; at first, with a fair degree of confidence. They also indicate how he began to realize that he did not really know the best way, and how he asked for guidance in finding out. The school was the 'down East' school in London in which, so far, all the spelling experiments described have taken place. The boys read fairly well, but it was said they spelt very badly.

The boys who did the work were graded as Standard I—a normal group of boys, since the Infants' department contained no class graded as a Standard class.

ii. *The First Method Employed to Improve the Spelling.*

Near the close of every afternoon session, six easy words, whose pronunciation and meaning were known to the boys, were written on the blackboard. The pupils were provided with slips of paper, and they were told to copy the words and learn them at home. The circumstances were not wholly unfavourable for home lessons; since, though the children lived in poor, and, in many cases, in crowded homes, their Jewish parents were keen—unlike so many of our English ones—that their children should learn and so get on in the world. The boys copied the words, but did they all learn them at home? Every morning the teacher of the class dictated the six words that the boys had been instructed to learn the evening previous. On the Monday following the week in which the 30 words had (or had not) been studied—six words had been given for each of five evenings, Monday to Friday inclusive—the Head Master dictated the whole list of 30 words. Teachers will be prone at first to think that a description of such a common experience is hardly worth while. But the value of it lies in the continuance of the method, and the careful tabulation of the results. For twelve weeks this process was repeated, from August 26th to November 15th. No improvement at all took place in the power to acquire fresh spellings in the class as a whole. Of the first 30 words, dictated on September 2nd, an average of 17.0 was spelled correctly; of the last 30 words, dictated on November 18th, the average spelt correctly was 17.0. Thirty per cent. of the class had shown no improvement any where along the series, and those who had improved had done so with many back-slidings.

The time taken averaged ten minutes a day, with an additional twenty minutes for the Head Master's weekly test, making a total of seventy minutes a week of school time for twelve weeks practice which showed practically no improvement. There certainly seemed no "transfer" improvement, the boys did *not* acquire the later sets more thoroughly and expe-

ditiously than the first. But of course they had learnt to spell, or many of them had, a number of words which they did not know before. The Head Master was not satisfied; he knew that, when learning by "good methods," children show steady and continuous improvement. In this case, after twelve weeks work, if they were improving at all, they were only creeping along, and some were not even creeping. And the school time: 70 minutes a week for it; was the result worth it? Wasn't the whole thing a futility? So he started out again by another method.

iii. *The Second Method Employed to Improve the Spelling.*

Hitherto, it was certain that the boys had copied the words, and had attempted next day to write them down when they were dictated, but whether they had made any visual or other repetitions of them at home was not known. Probably some had and some had not. The method had failed to produce rapid improvement, and it was costly in school time. A start was therefore made by another method on December 2nd. As before, the object was to teach, or require to be learnt, 30 words, whose spelling was, generally speaking, unknown, within one week. The lessons, ten minutes long, were taken at the commencement of every afternoon session, five lessons a week, at 2.05 p. m. The words selected may prove of interest to teachers. They were as follows:

bird	mouse	butterfly	flower	bluebell
sparrow	bear	snake	daisy	fruit
goose	wolf	worm	lily	orange
swan	monkey	wasp	wallflower	pear
gooseberry	carrot	sugar	coffee	wine
turnip	bean	water	cocoa	brother

The words were written on large cards (12 inches by 15 inches), one word on each card. The boys were provided with pens and slips of paper. Each word was shown to the class for 10 seconds. At the commencement of each exposure, the Head Master pronounced the word in a clear loud voice. At the end of the ten seconds the card was removed and the boys were told to write the word down quickly. Twenty seconds were allowed for writing, and the next word was pronounced as before. The boys were instructed to learn the words by looking

at them, but, in actual practice, they muttered the letters as well, whilst they were looking at them; but it was a subdued, and, as it were, a contrary-to-order muttering, which made it rather a surreptitious affair. The first ten of the thirty words were exposed, studied and written from memory, one at a time, within five minutes: in the remaining five minutes of the lesson they were repeated in exactly the same way as before. On the second day the next ten of the thirty words were studied in precisely the same way, and on the next day the third or concluding ten. On the fourth day, twenty skeleton words were placed on the blackboard, for example, ird: s arr w : g se : etc., and the boys were told to complete as many as they could. They liked the exercise, but found it difficult: very few boys completed the whole twenty. On the fifth day the ten remaining words were skeletonized, and also ten of the most difficult in the list. The boys did not work at the completion of them with much success. On the following Monday morning the whole list was dictated. There was an average number of correct spellings amounting to 17.7. "Not a very great advance on the previous method," said the Head Master. "I believe the 'skeleton' words were of little use and I shall discard them." The method was costly in time too, seventy minutes for 30 words. I shall try again."

But some of the weaker boys spelt better than they had ever spelt before.

iv. *The Third Method Employed to Improve the Spelling.*

Once again it was proposed to require 30 words to be learned within a week, to give 10 minutes a day to them, and, as before, to have the work done visually without overt articulatory and auditory factors.

The words selected were as follows:

round	feed	found	jumps	folk
line	uncle	thought	kitten	miss
own	twice	poor	fight	back
lamp	early	bricks	always	frock
pocket	catch	bark	arm	tart
awake	house	candle	night	rock

We did not know how many of these words the boys could spell already, before the special practice; and it is possible

that the boys were by growth and practice at a different slope of their curve, so to speak, this week than last; and these words also may be easier or harder than the last set. Teachers would, I think, say they were easier. It was the consideration of points like this which forced the Head Master to ask for help in framing more conclusive experiments. Still, if this work is corroborative of more exact experiments, it will not be unprofitable to record it.

On Monday, at 2.05 p. m., the first ten of these words were exposed, one at a time, and pronounced by the experimenter as in the second method, twenty seconds being allowed for each word to be written from memory by the boys. This took 5 minutes; the same words were given again in the same way during the remaining 5 minutes of the lesson. On Tuesday the next ten words were studied, and on Wednesday the third and concluding ten. Each word had, so far, been exposed twice and written from memory twice. On Thursday ten of the hardest words in the set were exposed and written twice; and on Friday—the fifth day—ten more of the harder words were dealt with. The twenty harder words had, therefore, been exposed and written from memory four times. There was, on this occasion, no 'skeletonizing' of the words. On the following Monday morning, December 16th, the whole list of 30 words was dictated. The average number correctly spelt was 20.8 and every boy in the class was able to spell *some* words correctly. This looked like a distinct improvement, but the method was costly in time; and was rather complicated. For there were, undoubtedly, some articulatory and auditory factors employed, as well as visual ones, for the boys 'forgot themselves and muttered': and there was a graphic motor factor as well, with a renewed visual stimulus working favourably for those who wrote the words *correctly* from memory after exposure, and unfavourably for those who did not.

v. *The Fourth Method Employed for Improving the Spelling.*

The teacher of the class, a young man fresh from Training College, now raised an objection to the Head Master's procedure. He favoured a frankly open appeal by a combined visual, auditory and motor-articulatory stimulus. He

thought the Head Master's method was too predominantly visual and that he himself could do better. So the Head Master and he decided to teach for a week against each other. They picked out two lists of words of apparently equal difficulty,[2] and taught each by his own method. They did *not* test the equality of the lists beforehand, as they should have done; but they timed each other's work, and kept each other rigidly to the methods stipulated at the outset. The assistant took the mornings, at 9.45, the Head Master the afternoons, at 2.05. The Head Master taught his 30 words precisely as in the third method, 10 minutes for each of five lessons. The assistant teacher's method was frankly a combined one. On the first day ten words, written on the blackboard, were, one by one, spelt and pronounced once by the teacher and then spelt and pronounced, one by one, twice by the boys in simultaneous work. After that the ten words were spelt through again, twice each, by the boys, without the teacher's example. Then the hardest words of the ten were spelt once again. The weaker spellers then, without the other boys, spelt the words twice. The stronger spellers were now, with their backs to the blackboard, called upon to spell the words, whilst the weaker pupils checked them from the board. Then the weaker boys were also called upon to spell with their backs to the board.

This procedure seems a good deal to get through in ten minutes but the Head Master was checking the time, and it was religiously observed. On the second day the next ten words were dealt with in the same way; and on the third day, the

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[2] *List of Words Taught by the Head Master.*

week	ship	soap	Friday	four
minute	whistle	wax	Summer	six
month	salt	candle	Winter	eight
time	iron	silk	holiday	ten
ball	clay	Monday	Christmas	second
hoop	lead	Wednesday	two	fourth

List of Words Taught by the Class Teacher.

day	doll	glass	Thursday	three
year	bat	gas	Spring	five
hour	coal	string	Autumn	seven
night	zinc	paper	season	nine
toy	stone	Sunday	Easter	first
train	gold	Tuesday	one	third

third and concluding ten of the thirty words. On the fourth day—Thursday—the boys spelt and pronounced all the thirty words twice, not after the teacher. This occupied some 4 minutes: the remaining six minutes were taken up by the boys writing down as many of the 30 words as could be done in the time from dictation. On the fifth day all the words were spelled again twice, by the boys, and again the rest of the lesson was given up to dictation.

I need hardly say that these little dictation exercises were not returned marked to the boys; it might have given an undue advantage to the class teacher's method, and would have been costly in time. On the following Monday the two lists were dictated. The average number of words spelt correctly by the Head Master's method was 22.9, and by the assistant's method was 23.0.

The Head Master's method was less laborious in teaching, for he did nothing but pronounce and expose the words; the assistant's method was much more laborious for him. The comparative results were close; each stuck to his own opinion, and in the conflict of argument called upon me to decide. I said that I did not know, but that I would show them how to find out which was the better method. Couldn't I tell, said they, from some mathematical or other analysis of the figures? The answer was in the negative. A consideration of the reasons given will show how we were forced to use the exactly controlled procedure of the First and Second Experiments.[3] First of all, we did not *know* that the two sets of words just employed were equal in difficulty for the class. Secondly, the two methods were taught by two teachers *not* of equal experience and skill. Thirdly, the one lesson did not enjoy quite the same advantage in the placing of the lessons as the other, for one was in the mornings at 9.45, and the other in the afternoons at 2.05. And fourthly, I said, we should have to work with fresh and unsophisticated children; for these Standard I children were, by now, unequally practised; the Head Master's method was too dominant. Then the methods, if we wanted to *prove* anything, should be kept more distinct from each other.

All these conditions were observed; and the researches

[3]Part I. and Part II. of this Research.

directed by me, and called 'A First Experiment' and 'A Second Experiment,' followed.

vi. *Conclusions from the Subsidiary Experiments.*

The outstanding conclusion is of course the need for *controlled procedure with exact measurement.* Point by point, by the logic of events, teachers who try these issues for themselves, are driven along until they reach conditions of experimenting which they see for themselves are valid. They cannot usually invent valid experiments, but they can carry them out (with a year or two's practice); and they are admirable critics of what constitutes validity. They come to an *impasse,* and appeal for guidance. This guidance it is the duty of every educational authority to provide. I do not mean that the authority should appoint superior persons to *tell* the teachers what methods to adopt: the superior persons do not really know any more than the teachers do. I mean that *educational psychologists should be appointed who could help the teachers to find out.* Dozens—hundreds of teachers could set to work (under guidance) to *make the science of experimental pedagogy.* The educational psychologist wants no coercive powers: the teachers *will come to him.* And they will hold debates among themselves, each describing his own experiments, and criticising those of others. Mere talk will be at a discount, and the men and women who can *prove* good methods will come into their own. Is this a mere ideal? Oh no, it is what freedom of method to teachers and encouragement to them to experiment will inevitably lead to.

To return: from the *subsidiary experiments* the combined method seems likely to prove the better for these children, but the imperfections of procedure drive us on to the controlled procedures of the First and Second Experiments. The subsidiary experiments illustrate genetically the pathway to experimental pedagogy.

vii. Summarized Conclusions from Part I and Part II of the Research.

The 'Subsidiary Experiments' preceded the 'First' and 'Second' Experiments in order of time. From them we were driven on to the more carefully controlled experiments known

as 'First' and 'Second.' As far as anything was indicated by the 'Subsidiary' experiments, they showed a balance in favour of methods with combined stimuli and directed attention. But the children who did the work were of low grade (Standard I) and very young (from 7 to 8 years of age), and it is a commonplace of pedagogy that young and mentally undeveloped children require external stimuli to direct and maintain their attention to an extent which their elders do not. With Standards II and IV, children ranging from 8 to 11 years of age in the same school, however, similar results were obtained. The method with pronounced auditory and articulatory factors, as well as visual ones, and with more direction of attention by the experimenter, showed itself definitely superior to a method more purely visual and with less direction of attention. I do not propose to generalize the results beyond the conditions of the experiment. This method may not be the better for English children, nor for any children of a superior mental type. I am prepared to accept the possibility that children, trained to a greater extent to work by themselves than these children had been, might do better on a visual silent method. I also stress the point that it is *not* recommended that lists of words should be picked out irrespective of their meaning, their orthographical construction, or their occurrence within a graded system of teaching reading. Moreover, we have not disproved the feasibility of success by an indirect or incidental method. But we *have* shown that when new spellings are to be acquired by children of this age and mental type, a method which contributes pronounced articulatory and auditory factors, as well as visual ones, is more successful than a method which depends almost wholly upon the latter.

The question of analytic or synthetic methods of teaching reading and orthography with *very* young children is not raised. This is Senior School work, and in Senior Schools the orthography to-day is almost invariably taught by an alphabetic (not phonic) spelling method of some kind, with visual, auditory, articulatory, graphic stimuli or combinations of these. To teachers in Senior Schools in poor neighbourhoods this research especially appeals.

THE END.

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IS MYOPIA INHERITED OR ACQUIRED?

(Communicated by G. M. Whipple.)

(*Studies from the Cornell Educational Laboratory, No. 17.*)

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In text-books dealing with the hygiene of the classroom, we frequently find conflicting statements dogmatically made concerning the causes, conditions, and treatment of myopia. We are told by many authors that myopia is almost invariably present at birth, that it progresses under the influence of unhygienic conditions, that it is the product of civilisation. Some writers maintain that myopia is congenital; others declare that it is acquired during the school-period; some that it is incurable, others that certain forms of it are curable. When we come to the consideration of specific causes, we again face a great divergence of opinion. These text-books, written at different dates, at different technical levels, and from different points of view, usually make no attempt to cover a large portion of the literature, extensive as it is, concerning this topic. It is the intention of this article to bring most of the theories proposed and the conclusions reached as the result of investigations in this field up to the present time to a definite focus and, on the basis of this sort of a summary, to draw the most obvious inductions possible under the circumstances.

To understand adequately a discussion of this nature, a general review of the structure and mechanism of the eye will be of advantage. Externally, the eyeball, resting on adipose tissue beneath and behind it, is partially surrounded by a bony socket. Through the rear of this socket passes the bundle of optic nerve-tissue and blood-vessels that enter the back of the eyeball. The eyeball is moved about in this socket by means of six muscles fastened at one end to the surface of the eyeball not far from its equator, at the other end to the rear part of

the socket about the opening through which the optic nerve and blood-vessels pass. Of these six muscles, four are recti (external, internal, superior, and inferior), *i. e.,* they pull directly back; and the remaining two are oblique (superior and inferior), *i. e.,* the direction of the pull is approximately from the right and from the left. The external and internal recti move the eyeball about the vertical axis (right and left); the superior and inferior recti rotate it about its transverse axis (up and down); while the superior and inferior oblique turn it about its anterior-posterior, or sagittal, axis (up-right, down-left, and *vice versa*). The superior oblique is peculiar in that, while, with the four recti, it is attached to the rear of the socket, it accomplishes its pull in a transverse direction by passing through a loop of cartilage on the nasal side of the eye at a point near the equator. Naturally, all of these muscles always operate in pairs and, very frequently, in combinations of pairs. This fact needs to be recalled when we discuss the theories concerning the cause of myopia with special application to these external muscles.

Normally the eyeball itself is approximately a sphere with a slight bulge of less than a millimeter at its anterior part. It consists chiefly of three coats: on the outside, the heavy, opaque, sclera, becoming transparent in front at the cornea; within this, the less tough, dark, choroid ending in plaits at the ciliary processes; and within this, the retina, covering a little more than one-half of the back portion of the eye. In front of the ciliary processes arises the iris and, at their farthest extremity, the so-called *zonula cilaris,* a circular suspensory ligament which is attached to the edge of the capsule containing the lens. Before reaching the ciliary processes, the choroid curves away from the sclerotic coat. The two membranes are separated in this region by a cushion of striated muscular tissue, the ciliary muscle. Some of its fibers are circular in direction, passing around the lens, and many more gradually become transverse, converging from about a point where the sclera passes off into the cornea, where they are attached to points along the front end of the choroid. The interior of the eyeball is divided into two chambers, separated by the lens with its ligamentous attachment and the iris diaphragm. The

posterior chamber contains the vitreous, and the anterior the aqueous humor. Feeding out of the anterior chamber, in addition to other porous tissue, there are imbedded in the sclera at the place where it passes into the cornea, the canals of Schlemm. The ciliary processes and the rear parts of the iris are also perforated with recesses and canals. This description gives the salient anatomical features which concern us in a discussion of the points in dispute in regard to myopia. The facts can be found described with greater detail in Howell (13, p. 300), Noyes (15, p. 2), Cohn (4a, p. 5), and Hess (12, p. 48).

Concerning the mechanism of accommodation whose function it is to focus the image of an outside object on the retina of the eye, primarily by a change in the shape of the lens, there is practically universal agreement. The explanation offered by Helmholtz in 1853 and based on investigations of Cramer (1851) and Langenbeck (1849)—*v.* Hess (12, p. 266)—is accepted with only minor modifications by most physiologists and ophthalmologists. The focusing is performed essentially by the meridional ciliary muscles (muscles of Brücke), but also, to some extent, by the sphincter muscle (muscle of Müller), and the mode of functioning has lent itself to favorable observation (*v.* Hess 12, p. 254). These muscles in their contraction pull the choroid surface of the ciliary processes toward the axis of the lens, releasing the tension of the zonula and allowing the elasticity of the capsule of the lens to bring about a bulging of its anterior surface and a consequent elongation of its axis. The posterior surface of the lens also becomes somewhat more convex, but because the zonula is attached more toward the anterior surface that portion of the lens suffers the greater change. In the process of accommodation, the front surface of the lens is brought forward, the distance between it and the cornea is reduced, and the pupil becomes smaller.

There are several other hypotheses concerning accommodation, the best known of which are, perhaps those of Tscherning (26, p. 1) and Schoen (20, p. 427). The former believes, and advances facts to prove, in his opinion, that during accommodation the ciliary muscles contract with an opposite result from

that outlined above. They produce, he says, a tension of the zonula, so that the body of the lens is pulled slightly back toward the retina, is pressed against the vitreous humor, and in this manner is caused to become more convex in its anterior surface. Demonstrations are reported to have been made on the eyes of oxen. Schoen has suggested that the posterior part of the eye, including the lens and the rest of the eyeball, acts, under the process of accommodation, much in the manner of an air-filled rubber-ball. When the ciliary muscles contract, the sides of this ball are pulled in around the lens, and the front surface of the lens, confined to its capsule, becomes, under this pull at its equator, more convex. The anterior portion of the eyeball would then assume a bell-like shape with the pupil at the apex of the bell. In many details, both of these theories are considered by most physiologists to be inferior to the explanation given by Helmholtz. Experiments have been performed which appear to refute their suppositions and implications.

The term 'myopia' gets its derivation from one of the symptoms of an acute form of the defect, *viz.* the blinking involved in what Donders (5, p. 1) calls the 'working away' of diffusion circles attendant upon unclear vision. Closing the aperture of the eye by means of the eye-lids gives clearer outline to an otherwise blurred image. Jackson (in Norris and Oliver, 14, vol. I, p. 493) defines myopia as "that condition of the refraction of the eye in which the principal focus falls in front of the retina. It may be due to excessive curvature of one or more of the dioptric surfaces (myopia of curvature); or to the increase in the index of refraction of the nucleus of the lens (index myopia); but commonly it is caused by excessive length of the anterior-posterior axis of the eyeball (axial myopia)." Hess (12, p. 334) says "theoretically myopic refraction can be caused by the following conditions: (1) Too great length of axis of the eyeball. (2) Too great curvature of the cornea. (3) Too great curvature of one surface of the lens or of both surfaces. (4) Too high total refraction-index of the lens occasioned by (*a*) too high a capacity of refraction of the kernel of the lens, (*b*) too low an index of refraction of the rind of the lens, or (*c*) by both. (5) Too high an index of refraction of the cornea or aqueous humor. (6) Too low an index of refrac-

tion of the vitreous humor. (7) Too close proximity of the lens and cornea. (8) Conditions in which more than one of the above are simultaneously operative." He points out that of these the first two are the most frequent causes. Noyes (15, p. 90) agrees with this statement when he says, "There are two kinds of myopia. In the one the refractive power of the media is excessive, while the optic axis is of normal length. In the other and common form, undue elongation of the optic axis is the essence of the error." Bates (2c, p. 1) makes a usual distinction when he defines myopia as "that state of the visual organ in which parallel rays of light meet at some distance in front of the retina. When this displacement of the focus is the result of an elongation of the eyeball in which there is a bulging of the back part of the eye, posterior staphyloma, the myopia is permanent; but, when the myopia is due to muscular action which may increase the curvature of the lens or modify the form of the cornea or elongate the globe of the eye, then the myopia may be considered as functional and curable." The defect was well known in ancient times, and was frequently discussed in connection with the slave-trade where a distinction between *myopia ex natura,* the slight and occasional sort, and *myopia ex morbo,* the diseased condition, was made. Aristotle, long before this, had inquired into two problems connected with myopia: (1) Why short-sighted people blink and (2) why they write a comparatively small script. But it was left to Kepler at the beginning of the seventeenth century to give the correct physical explanation of the phenomena.

Leaving the specific etiology of the defect and passing to the generic, we find our attention at once directed to the controversy on the question of the acquired *vs.* the congenital origin of myopia. On the side of the congenital transmission, we have two possibilities: either the defect may be caused by direct transmission through hereditary channels, or the defect may be caused by intra-uterine conditions. In the first case the tendency to the defect may be inherited in the form of secondary anatomical conditions (diathesis), such as weakness of the choroid, and particularly of the sclera, deformed anatomical structure of the head or socket, *v.* Cohn (4a, p. 51),

Parsons (16, p. 968), Smith (21, p. 1162), Fuchs (9, p. 758); or again the immediate conditions which ordinarily give rise to myopia may be inherited *en bloc, v.* Risley (14, p. 362), Steiger (22b, p. 229), Barrington and Pearson (1, p. 42). Many authors are divided in opinion as regards the inheritance of some aspects or forms of the defect. Cohn (4a, p. 93) after citing verdicts on both the acquired and the inherited characteristics of myopia, concludes "that the question of the heredity of myopia is not yet decided; that the transmission of the tendency of myopia is at least highly probable, but that in very many cases, without any hereditary predisposition, myopia is developed by other causes." Steiger found, in 95 instances of actual family disposition to myopia, 70 cases that could be directly traced to hereditary influence, with a marked increase in degree and in earliness of appearance from generation to generation. As the generations were traced, myopia seemed to appear earlier at each step, *v.* Hess (12, p. 349). Barrington and Pearson, who have gathered and tabulated numerous statistics of school children in connection with the London Eugenics Laboratory, claim that myopia and myopic astigmatism, together with other visual defects, are inheritable (1, p. 47). "Without laying any stress on these special numerical values, I think we may take it that they generally confirm the previous conclusion: that the physical characteristics of the eye are hereditary qualities, and that the intensity of inheritance is probably exactly the same as that for other physical characteristics in man." Not only do these investigators believe that their statistics prove this point, but they have gone a step farther to show that environment, in the form of number of people in the same room, physical condition, health, and moral condition of parentage, is a negative factor in increasing the defects of vision, so that (1, p. 55) "normal vision is on the whole *slightly* associated with overcrowding, bad economic conditions, and morally defective parentage." A statistical investigation which leads us to a diametrically opposite conclusion is quoted by Gullstrand (10a) in the 3d edition of Helmholtz's *Optik*. As the result of a systematic examination of school children by Widmark (27) in Sweden, Gullstrand emphasizes the marked decrease of myopia with the hygienic

improvement of conditions in the schools of that country, and hopes that Germany will ultimately learn the lesson and abandon the use of Gothic type and cramped penmanship in its schools. Risley takes the position, on the strength of observations during a long period of ophthalmological practice that, while the parents of myopic children may not suffer from myopia, they very often suffer from other visual defects such as astigmatism and hyperopia or a combination of both, *v.* Norris and Oliver (14, vol. II, p. 358). Erismann (7, p. 1) found that myopia was inherited in 30 per cent. of the cases investigated, but his results are disputed by Nagel and others. Eversbusch points out the effect of inbreeding on the transmission of visual defects. He believes that the appearance of myopic conditions during school life and especially during adolescence is to be explained on the ground of poor local nourishment at the part affected and of improper physical development (8, p. 14). These conditions can be produced by inbreeding, and at any rate are frequently traceable to family relations (*ibid.*, p. 13).

The authorities who hold to an intra-uterine cause of myopia have very little evidence to prove their point, and, in fact, the data are difficult to obtain. The literature devotes little space to this view and Parsons (16, p. 968) only mentions it as a possible cause. The matter figures more as a logical possibility and implication whenever narrow formations of the skull are spoken of, *v.* Hess (12, p. 344). But there seem to be as many indications that large skulls, especially skulls which involve a large distance between the pupils of the two eyes, are responsible for myopic conditions. The supposition would agree more satisfactory with the 'convergence theory' to be considered below. This sort of a formation would again be attributed, of course, to uterine conditions, *v.* Barrington and Pearson (1, p. 4).

But, while some writers are not very definite as to how much emphasis should be laid on the inheritance of the tendency or diathesis to the defect, and how much of a rôle can be assigned to environmental conditions toward developing that predisposition to the defect, by far the greater number put stress on acquisition from the environmental agencies. The majority

of these believe that attending to work with comparatively small objects near at hand is the direct cause of myopia. The notion is, naturally, an old one. Myopia was attributed in the middle of the 17th century to *legere minuta superflue* by F. Plempius. But if we seek specific causes for the defect, we shall find a host of different ones given. The most important of these, however, can be arranged under six headings which follow:

1. *Intraocular pressure.* It is believed by Erismann (7, p. 1) and others, *v.* Hess (12, p. 338) that during the process of accommodation, the lens and the anterior parts of the choroid are pulled in and partly back toward the retina with the effect of increasing the pressure of the vitreous humor. Since the eyeball is enclosed in a system of musculature about its equator, and is not so confined back of the fundus, the posterior portions are pressed out, eventually elongating the eyeball and, in extreme cases, causing *staphyloma posticum,* or atrophy of the choroid about the optic nerve, *v.* Cohn (4a, p. 43). Besides advancing the theoretical argument against this supposition that such a state of affairs ought to be much more prevalent among hyperopic cases because the process of accommodation is naturally more frequent in this condition when the lens is normally near infinity-focus than in myopic cases, Hess has shown conclusively (12, p. 244) that under the act of accommodation the lens becomes free to move to a greater extent than before, so that when the normal eye is accommodated for a near point, the lens falls slightly down out of the line of the axis, when the head is moved downward. More than this, the lens actually is seen to shake (*schlottern*) with the head under the act of accommodation. From this Hess concludes that the lens must exert very little pressure on the vitreous humor. In this connection it should be borne in mind that movements of the interior parts of the eye are to some extent provided for by the system of canals and recesses about the ciliary processes and the iris which absorb the humors and provide for nourishment of the interior tissues.

2. *Turgescence.* It is claimed by Risley and other ophthalmologists that the bending of the head over one's work brings about the congestion of blood-vessels in the eye with the result

that under certain conditions, *e. g.*, weak tissues, the coats of the eye give way and thus change the refractive index of the instrument. Risley says (in Norris and Oliver, 14, p. 364): "Careful and repeated studies of individual cases as noted above have demonstrated that, for these cases certainly, tender, readily yielding, sclera of youth had distended under the strain, and the probable increase of tension, produced by the prolonged turgescence of the intra-ocular tunics, thus bringing about the observed increase in the refraction." Many ophthalmologists suggest this sort of an hypothesis when they speak of eye-strain, *v.* Gould (10, p. 1) and Dresbach (6, p. 17). Emphasis is placed by these writers on the complications set up in the functioning processes of nutrition and blood-circulation, when eye-strain affects the eye. Very often practitioners say that when a myopically astigmatic eye is corrected for astigmatism, myopia itself is reduced. Gould dwells on the strain reflexly caused by the differences of adjustment between the two eyes, and Risley declares that many myopic eyes have grown out of astigmatic conditions.

3. *Convergence.* The effect on the shape of the eyeball caused by continued use of the muscles of convergence is a matter which frequently comes up for discussion, *v.* Burgerstein and Netolitsky (3, p. 870). It was for a long time assumed that these muscles contributed as a class to the ultimate elongation of the eyeball, since they lay at the sides (equator) of the eye and by jerking continually could force the opposite parts of the eye against the corresponding muscle of the same pair. A. v. Graefe and his followers went so far as to favor tenotomy for relieving myopia, and thousands of operations were actually performed with this end in view. Some ophthalmologists still firmly believe that these muscles largely contribute to the establishment of myopic conditions (Bates, 2 b, p. 1), but the assumption that all kinds of myopia are traceable to this cause would not have much foundation. There are too many other conditions, such as refractive errors in the dioptric media themselves, which could not be explained directly from this cause.

4. *Orbital configuration.* Stilling (23, p. 37) is known as the originator of the notion that myopia is, in a large percentage

of cases, due, not to the effect of all of the muscles of convergence (because for anatomical reasons this would be impossible), but to the effect of the superior oblique and in particular to the position in the orbital socket of the cartilaginous pulley through which it passes. This muscle is in especial use in reading. If, therefore, the pulley is too low in the socket, the superior oblique will wind abnormally about the equator of the eyeball and thus press upon and elongate it. This might eventually favor unusual catabolism of the interior tissues and cause, through increased pressure, a separation of the fundus.

5. *Accommodation-cramp.* Iwanoff, in 1869, discovered that in many cases of myopia the ciliary muscles of accommodation were, on *post mortem* examination, abnormally developed. From this finding and from other inferences, many authorities conclude that myopia of a certain kind is produced by abnormal contraction of the ciliary muscles. But, as Bates (2 b, p. 10) points out, this state of affairs is caused directly by improper and unsuccessful efforts on the part of the accommodation-muscles, and to some extent also on the part of the entire external musculature, to see distant objects, after the eye has been habituated to nearby objects. This type of myopia is called *functional* in contrast to the permanently deformed conditions found in some eyes. To quote (2 b, p. 8): "It was interesting to note that these same individuals (patients with emmetropic or normal refraction under atropine) always produced myopic refraction, usually greater in the horizontal meridian, while making an effort to see distant objects; when an effort to see near always produced the opposite refraction, hypermetropia, and greater in the same meridian, the horizontal." He claims that, by a process of re-educating to see distant objects successfully, he has absolutely cured a large percentage of cases of functionally myopic school-children out of a total of about 10,000, and has materially improved the remainder.

6. *Optical nerve-tension.* The Hasner-Weiss theory (Hess, 12, p. 347) assumes that with the movement of the eyeball in the act of convergence there is a slight but perpetual torsion or tension of the optic nerve which gradually pulls

the fundus back and ultimately separates it from the other tissues, producing thus the permanently diseased condition found in some cases. This tension would be greatly enhanced if the optic nerve happened to be abnormally short. Stilling retorts that out of 200 sections of the eye he found relatively few short optic nerves.

A word about the frequency of myopia. Jäger in 1861 claimed that 78 per cent. of all new-born children were myopic. This percentage was gradually reduced by other investigators who used atropine to cancel the effect of the muscles of accommodation to 10 per cent., 3.4 per cent., 2 per cent., and more recently 0 per cent. Hess (12, p. 332) admits wide variations at birth due to maladjustment of the muscles of accommodation, admits also that in part myopic conditions are present in the greater curvature of the cornea, but concludes that the axis of the eye is relatively longer at birth. He quotes, among others, Herrnheiser's figures derived from the examination of 11000 eyes to the effect that at birth there is 0 per cent. myopia and emmetropia, and 100 per cent. hyperopia, while at 75 years there is 20 per cent. myopia, 30 per cent. emmetropia, and 50 per cent. hyperopia. Risley, from the data of an examination of a large number of school-children (18, p. 1) in Philadelphia, gives the following figures: at 8.5 yrs. of age there is 4.27 per cent. myopia, 7.01 per cent. emmetropia, and 88.11 per cent. hyperopia; while at 17.5 yrs. of age there is 19.23 per cent. myopia, 12.28 per cent. emmetropia, and 66.84 per cent. hyperopia. Erismann, in an investigation of 1245 school-children in St. Petersburg, found that in the lowest (1st) grade there was 13.6 per cent. myopia, 18.6 per cent. emmetropia, and 67.8 per cent. hyperopia; while in the highest (7th) grade there was 42.8 per cent. myopia, 21 per cent. emmetropia, and 36.2 per cent. hyperopia. In general, these results indicate that on the average there is a gradual increase in myopia, a practical uniformity of frequence of emmetropia, and a decrease in hyperopia; and that throughout life there is a prevalence of hyperopia among the people of those nationalities (Germany, Russia, England, and the United States) where systematic investigations have been carried on.

To sum up the general causes of myopia as briefly stated on the authority of a large number of trustworthy sources, we may say that the question of inheritance *vs.* acquisition of myopia must remain an open one as long as we are permitted to discuss in terms of disposition, tendency, or diathesis. The array of statistical data must in itself be a precarious undertaking as long as our terms are gross, and as long as 'myopia' may mean several different things. 'Myopic astigmatism' is a complicated condition of defective vision. Even myopia is, as we have seen, of various sorts. We have not yet established what are the unit characters involved in myopia, what kind of myopia is inherited. Authorities seem to believe that certain sorts, especially the condition involving *staphyloma posticum,* is inheritable, but we have no facts and no statistics to prove the case. In regard to the generic causes of myopia, it is only possible to state that we get the impression of a variety of influences which may bear on the production of the defect. Since the kinds of specific causes are, according to the best authority, at least seven in number, and since any one of them is adequate to the production of a myopic defect, it is entirely possible in our mind that any one, or a combination of several, of the six generic causes given may be responsible for the condition. The only one which seems to be inadequate, as far as present evidence goes, is the explanation of increased intra-ocular pressure produced by the process of accommodation. It has not yet been shown that the increase of intraocular pressure due to the effect of convergence-muscles, and especially the superior oblique muscle, is not responsible for some of the conditions surrounding myopia of the axial variety. In brief, it is perfectly fair to say that there is not a single explanation given with the weight of authority behind it which is not disputed by an authority of equal weight. Most authorities content themselves with the recognition of a number of possibilities in the way of causes of myopia. Most of the important ones we have presented, and we must wait for the future to decide which ones, if any, to reject, and which ones, if any, to accept and add.

While, therefore, the scientific literature of today does not allow us to assume an unequivocal position in regard to the hereditary or environmental causes of myopia, yet the opinion of reputable ophthalmologists persuades us to believe that both types of causes have a share in the initiation and development of functional myopia. It is generally stated that if there is a diathesis present toward some form of functional myopia, too close application to work and undue strain on the eyes may operate as a precipitating factor toward myopic conditions. So that, however much we may be impressed by the statistics in regard to the inheritance of myopia, the facts so far advanced do not seem to be conclusive enough to warrant the discontinuation of our present campaign for better school conditions, especially at that age (about adolescence) when statistics show the greatest frequency toward myopia. And, above all, there ought to be some systematic testing of the eyes of school-children to detect the presence of myopia in its incipient functional stages and to prevent its further development.

Even if there is diathesis toward myopia present, hygienic conditions will operate to prevent that tendency from becoming effective in the production of myopia. If, for instance, there is an inherited tendency toward weak tissues, the avoidance of unnecessary close work involving muscular pressure on the eyeball, or the prohibition of an incorrect sitting posture inducing turgescence in these tissues, may make toward unfavorable conditions for the acquisition of myopia.

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COMMUNICATIONS AND DISCUSSIONS.

INEXPERT BINET EXAMINERS AND THEIR LIMITATIONS.

At the Fourth International Congress on School Hygiene the Binet tests were severely criticised on the ground that inexpert examiners who can do only "mechanical" Binet testing are, by the use of the tests, diagnosing children as "normal," "backward," and "feeble-minded." It has seemed to me that it were more just to attack these *examiners* and lay the fault at their door rather than to condemn the tests. It is, of course, to be regretted that the Scale is suffering under the use to which it is being put by persons who attempt to draw conclusions which their knowledge and experience do not warrant, just as it is also to be regretted that many inexperienced nurses incorrectly interpret thermometric readings, although in such cases we blame the nurse and not the thermometer. It has, of course, often been said, and cannot be too strongly emphasized, that to determine the normality or abnormality of children one must be expertly versed in more things than Binet testing. But in the hands of experts the Binet Scale is easily the best (though not the only) means yet devised for the intellectual examination of children, and indeed in their hands can safely be relied upon to diagnose about 90 per cent. of all cases, the remaining 10 per cent. to be subjected to other tests and criteria. It should therefore be urged that those who are capable of doing good Binet testing of the mechanical sort without being clinical psychologists should report the findings of their examinations of children or groups in tables of related chronological and mental ages and not in terms of normality or abnormality. In their reports they can say with a high degree of certainty that those children who show an intellectual retardation of more than 3 years are feeble-minded, but they should not say that those who test less than 3 years retarded are backward or normal. In these lesser degrees of retardation only the expert is capable of evaluating the details of a Binet test with any finality as to either diagnosis or prognosis. Some of the 'backward' and even a slight percentage of the 'normal' children will prove feeble-minded as soon

as they have added a few years to their chronological ages, for even the little that we already know about the intellectual development of the feeble-minded tends to show that some do develop nearly normally up to a certain point and then suddenly cease to increase in mental ability, and that others develop under a constant, but slight, retardation at each year. Of these two types the former will test normal until he reaches his limit of development and will then abruptly cease to progress, whereas the latter shows at each year a constantly increasing degree of backwardness up to the point at which he ceases entirely to develop. In these cases even the expert may do well to postpone any positive diagnosis, and, as Fernald recommends, "wait at least two years" before coming to a decision.

There is, however, one type of Binet examiner who may be qualified as well as, and sometimes better than, a clinical psychologist to make these delicate differentiations. I allude to that class of trained assistants who may not have had technical psychological training through formal studies, but whose extended experience at institutions for mental defectives has given them such thorough acquaintance with feeble-minded children that in giving a Binet test they intuitively *sense* distinctions that would escape the more astute examiner of greater knowledge but less experience. Examiners of this sort are not to be classed with those who have neither technical nor experiential knowledge of the proper use of the Binet Scale, whose information has been gleaned from a Binet pamphlet or from occasional observations of testings, or even from only their own practical use of the tests.

To return for a moment to the method of reporting results: at present there seems to be no other satisfactory way of reporting the results of Binet examinations than by stating both the chronological and the mental ages of the cases examined. Stern (W. Stern; *Die psychologischen Methoden der Intelligenzprüfung,* Leipzig, 1912, p. 55) recommends the use of a 'mental quotient' to express the relationship. He proposes to divide the mental age by the chronological age and let the resulting numerical quotient be the expression of the degree of the mental developmnt of the child in question. I do not believe, however, that this assists us materially, and, indeed, it may be quite misleading. Binet asserts, and our experience confirms him, that when an individual shows a mental retardation of more than 3 years he is undoubtedly feeble-minded, and that even 2

years retardation below the age of 9 is indicative of permanent mental defect. It therefore is of relatively little significance that a child is 5, 6, 7 or more years retarded, since the defect does not become more serious as the child becomes older. Furthermore, there might be all grades of mental defect finding expression in the same quotient. Thus, for instance, a 4-year old idiot of 2 years mentality, a 10-year old imbecile of 5 years mentality, and an 18-year old moron of 9 years mentality would all have the same mental quotient of .50. And, still further, this quotient would be continually changing for a given individual without there being any change whatsoever in the mental capacity of that individual. Our 10-year old imbecile would always have the same mentality of 5 years, whereas his mental quotient would be continually decreasing until, to take an extreme case, at the age of 100 years he would have the absurd quotient of .05. The mental quotient, then, is valuable only when the cases under consideration are all of the same age.

E. A. Doll.

Vineland, N. J.

ABSTRACTS AND REVIEWS.

ERNEST BURNHAM. *Two Types of Rural Schools.* New York: Teachers College, Columbia University, 1912. (Contributions to Education, No. 51.)

Dr. Burnham's thesis is a social survey and comparative study of a district in Northwestern Ohio that has consolidated schools with a district in Western Michigan that does not have consolidated schools. Facts were gathered and subjected to an elaborate statistical treatment, showing the economic resources, the common community activities, the family life, and the status of the schools in the two districts. The chapter devoted to a consideration of the schools presents tabulated material on (1) the relative economic and administrative phases; (2) the relative academic, professional and social qualifications and activities of the teachers and supervisors; (3) the relative attendance, activities, progress and occupations of the pupils, and (4) a summary of relative facts of a still more general educational nature. The concluding chapter gives a critical and rational interpretation of the data, together with several important, but tentative constructive criticisms. These criticisms relate to the problems of and the administration of schools in such districts; to the types of teachers selected by such communities; to the character of the instruction offered; to the relative retardating and eliminating influences, and to the possibilities for a wider institutional and social service possessed by the consolidated school.

Aside from the facts gathered and the conclusions reached, such a study as this is of value in that it supplies a thoroughly scientific method of work that can be employed in making other surveys. We shall not have thoroughly trustworthy facts until the study has been duplicated. However, Dr. Burnham must be given credit for having pointed the way and for having used the "survey method" in a new field of education. Without doubt there is no phase of public education about which we know less than rural education. It is an open, an inviting and fertile field.

LOTUS D. COFFMAN.
School of Education,
University of Illinois.

CHARLES DE GARMO. *Aesthetic Education.* Syracuse: C. W. Bardeen, 1913. Pp. 161.

"This book maintains that every child should acquire in school a first-hand aesthetic view of the world, as he now acquires an intellectual or a moral view of it. Our present aesthetic teaching is defective in several particulars: First, in that it is left to specialists alone; second, because, in consequence of this fact, it covers only a part of the world that is beautiful; and, third, because it tends to lead the pupil to look for beauty only at second hand, as in pictures of things rather than in the things themselves. The first requisite in giving the pupil this first-hand view of the beauties of the world is that the teacher should acquire it himself. To this end, the book attempts to give a direct, non-technical analysis of the meaning and expression of the beautiful as seen in nature and the arts. It shows how and where to look for beauty, not alone in pictures and statues, but also in nature and the domain of mechanics and of the arts that pertain to daily living. The second requisite is that the teacher should be able to impart the canons of good taste to the pupil, to lead him to see beauty wherever it exists, to distinguish the pretention of beauty from its reality, and to found and reinforce his appreciation by efforts at artistic creation, in drawing and music, to be sure, but also in language and in those every day arts that enhance the pleasures of life."

This quotation from the preface of this delightfully refreshing plea from the pen of Prof. De Garmo calls attention to a serious condition in our public schools—the great need of arousing the sentiment for the beautiful in every day life. It is not primarily a book for "teachers of art," but rather for the teachers of language, science, history, manual training, etc., and its principle mission is to inspire and arouse those who deal with commonplace facts to perceive and reveal the beauty which is in them. C. E. S.

THE
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EDITORIALS.

THE PSYCHOLOGY OF HIGH-SCHOOL LATIN.

Those who are anxious to see subject-matter and methods of our schools arranged with some regard for the tenets of educational psychology will read with interest, whether they agree or not with all its statements, the recent very stimulating report on "The Reorganization of Secondary Education" (Bulletin 551 of the U. S. Bureau of Education). The following paragraph is worth quotation here:

"If Latin is to maintain the high place which it has occupied in our scheme of education for so many generations, the teaching of it must be more vital. In content, scope, and method our courses must be adapted to the ability and to the interests of the children. We have been too busy trying to fit the children to the subject, rather than the subject to the children. Some of the tenderest-hearted of our guild have padded and smoothed the Procrustean bed a little here and there, but it is the same old bed upon which we force our victims to lie. If the subjects of our ministrations writhe and groan, we take their sufferings as evidence that our methods are effective, fortifying ourselves with the assurance that Latin is a 'disciplinary' subject, and that 'all chastening seemeth for the present to be not joyous but grievous, yet afterward it yieldeth peaceful fruit unto them that have been exercised thereby.' We have set an arbitrary standard of attainment and have selected our subject-matter with an almost incredible indifference to the psychology of adolescent girlhood and boyhood."

For one who has passed through some half-dozen years of Latin and nearly as many of Greek it is peculiarly difficult, after the lapse of a score of years, to estimate just what is left in the realm of knowledge or mental efficiency to show for this labor; nevertheless, the writer, for one, would wish that he had endured his chastening in some other bed, perhaps of biological or at least of scientific form. A little more thorough disciplining in modern languages could doubtless also have been endured to advantage. And speaking of 'discipline,' can one resist the thought, heretical as it sounds, that perhaps, after all, the efficiency of those who manage to go through the mill is more than nine-tenths native ability, ripened by Nature's own process of growth?

Again, may it not be that he who attempts to adapt the "content, scope and method" of Latin to fit high-school children may in the end find himself in the position of a man who, to get a better tool for writing, replaces a damaged fountain pen with a new nib, a new barrel and a new cap, one after the other, and then wishes he had bought a typewriter? G. M. W.

AN INTRODUCTION TO THE ELEMENTARY COURSE IN PSYCHOLOGY.

There has just come to the writer's desk an outline of Prof. Bingham's beginning course in psychology. In this is found a device which Dr. Williams and the writer have used with most excellent results for the last two years. It consists in requiring the class to read a chapter a day in Angell's *"Chapters from Modern Psychology"* during the first seven or eight class periods. This book gives a readable and serviceable survey of the scope of psychology. The reading is paralleled by lectures illustrating intensively some aspect of the field of psychology under discussion. Prof. Bingham announces the following lectures to parallel the chapters: (1) General psychology: the psychology of studying. (2) Physiological psychology: the nervous system and its elements. (3) Physiological psychology: the James-Lange theory of emotions. (4) Experimental psychology: combination tones. (5) Abnormal psychology: dreams and hypnosis. (6) Individual and Applied psychology: types of imagination. (7) Social and Racial psychology: the music of primitive peoples. (8) Abnormal: the mental life of a dancing mouse. (9) Genetic psychology: the Binet-Simon tests.

This year our paralleling lectures ran as follows (Chapter I being omitted as not being adapted to the purpose): (1) Physiological psychology: the nervous system and its elements, illustrated by lantern slides. (2) Experimental psychology: measurement of tonal hearing. (3) Abnormal psychology: the retarded child. (4) Individual psychology: Helen Keller. (5) Social psychology: man as a social being. (6) Animal psychology: "Clever Hans", illustrating animal intelligence. (7) Genetic psychology: the meaning of infancy.

Following these seven or eight exercises one class period is devoted to an examination (review) on the reading—not on the lectures. In a three-hour course throughout the year this three weeks' introduction is effective. It is our experience that after this preliminary the student has a serviceable knowledge of what psychology is about and has developed a desire for the work before him. The expense of the book can be simplified by placing a sufficient number of copies on the reference shelves, since it is to be read such a short time. C. E. S.

NOTES AND NEWS.

In reply to an editorial inquiry regarding newspaper accounts of the Dartmouth Freshmen Tests, the following note has been supplied by Professor Bingham:

"The tests of members of the freshman class which are being made by the psychology department at Dartmouth College are really much less pretentious than the constructive imagination of certain student reporters has led the metropolitan press to suppose.

The measurements being made utilize first of all the series of association tests standardized for the American Psychological Association by Woodworth and Wells. The purpose is to gather norms regarding associative processes in students of college age, and to ascertain which of these various association tests correlate most closely with abilities measured in other ways. The simplicity and the convenience of these tests under working conditions proves the skill and care with which they have been standardized.

"Among the other tests being used are tests of immediate memory for auditory digits and for sense material; tests of sensory discrimination with lifted weights; and tests of ingenuity, which include two simple puzzles and a 'form-blindness' test, so called, devised by Mr. A. S. Osborn,* the legal expert on handwriting and questioned documents. The only motor tests included are the tapping test with the right hand only, and endurance of grip, as standardized by Whipple.

"In the rest periods of the tapping test, the experimenter gleans some information from the freshman regarding his intended vocation, his chief interests and aptitudes in and out of school, his relative scholarship rank in preparatory school, and his use of tobacco. About two hours is required to complete the series.

"The practice of giving psychological tests to freshmen, for many years followed at Columbia, is apparently spreading to many col-

*Cf. Case and Comment, Vol. 19, pp. 800-807.

leges. A certain amount of co-operation and collaboration between institutions would multiply the value of the returns from this work. The feasibility of such co-operation will be one of the questions discussed at an informal round-table conference on 'Mental Tests of College Students' which will be held at the time of the meeting of the American Psychological Association in New Haven, December 29-31."

Under the direction of Professor J. Carleton Bell the entire freshman class at the University of Texas, numbering almost 800, was recently given a series of nine mental tests. These tests were based on the ones suggested by Professor Thorndike in his vice-presidential address before Section L of the American Association for the Advancement of Science, at Cleveland, last winter, with certain modifications to enable them to be given as class tests. They included cancellation, addition, association of word with figure, recognition memory, selective judgment, two forms of the Woodworth and Wells directions test, alternatives, and the Terman form of the Ebbinghaus completion test. The results are now being tabulated and will be reported later.

A Psychological Clinic has been established as a branch of the Psychological Laboratory in the State University of Iowa, with Dr. R. H. Sylvester as clinical psychologist. The clinic is in close co-operation with the medical school and the department of education, and reaches out into the public schools of the state. The clinical psychologist accepts invitations from the schools to spend three days at a time in examining selected groups of children. From such examination a certain amount of clinical material is gathered and great service is done by directions for medical care and home treatment and the way is paved for the introduction of the work of the consulting psychologist in the school systems of the state. In the treatment work of the clinic Dr. Sylvester and his assistants will specialize on speech cases.

The Board of Education of the City of New Orleans has recently established a department of educational research, and has appointed as director of the department Dr. David Spence Hill, formerly of Tulane University. The work that Dr. Hill is undertaking is of a threefold nature: (1) A vocational and educational survey of the city preparatory to the establishment of the Isaac Delgado Central Trades School for boys, to which Mr. Delgado recently bequeathed

nearly a million dollars. (2) A continuance of the study of individual cases of exceptional children according to the general procedure devised last year. This general procedure involves actual co-operation in every case of parent, teacher, medical inspector, physician specialist, social worker, and psychologist, each of whom turns in written reports, and all the data are summarized by the director. (3) Statistical studies concerning elimination, retardation, and repeating. A fuller account of certain phases of this work will appear in a subsequent issue.

Mr. W. A. Maddox, who has been associate professor of education and principal of the training school at the State Normal School, Farmville, Virginia, has left that institution to take charge of the training school in the Oswego Normal School. Mr. T. R. Garth, who has been doing graduate work at Columbia, comes into the department of education at Farmville, and Mr. J. M. Lear, head of the department of history at Farmville, takes the principalship of the training school. The Training School of the State Normal School, Farmville, Virginia, opened this year in its new building. This building was constructed to include all the requirements of a modern public school and also the needs of a training school. It is the result of five years of study and planning.

Dr. W. F. Book, state director of vocational education in Indiana, has inaugurated some interesting investigations preparatory to carrying out the new vocational education law recently enacted by the state legislature. These investigations are along three lines: (1) A vocational survey of the state is being made to ascertain the vocations and professions that are open to the young people of the state. An effort will be made to determine: (a) The opportunities presented by each, wages, hours of labor, chances for promotion, etc. (b) The nature and character of the work, its effect on the health of the worker, dangers, moral condition of occupation, degree of transiency or permanency of work, etc. (c) Kind and amount of preparation needed and cost of same in time and money. (d) Opportunities for receiving the necessary training for these vocations and professions, etc. (e) The facilities for vocational education and guidance in the state.

(2) A standard card is being worked out upon which will be kept a record of a pupil's special interests, his success with different types

of school work, and such other facts about his home conditions, mental and emotional traits, special talents and interests, as would enable teachers and parents to give valuable help in advising a boy or girl in the choice of an occupation or profession.

(3) An expert is to be secured to devise, verify and standardize tests that might be used by superintendents and principals to detect marked ability in brighter pupils in the field of art, music, mechanical manipulation, constructive work, science, business, invention, etc., so that these gifted pupils might early be given the opportunity of developing their special talents and capacities.

At the University of Missouri, the University Elementary School, in charge of Professor J. L. Meriam, has just issued a very artistic and attractive booklet containing many photographs of the children at work in the rooms of the new building, and setting forth the aims and methods of instruction. The public school curriculum is a vexed question at present. Professor Meriam has for years been working on a course of study which omits all specific reference to reading, writing, spelling, arithmetic, geography, and the like, but which centers the school work about the acitivities of the child and brings in the ordinary school subjects incidentally. How this is done is well set forth in the booklet.

At the meeting of the New York State Teachers Association, held at Syracuse, November 25, Professor Guy Montrose Whipple, of Cornell University, read a paper before the normal school and training class section on "The Status of Educational Psychology in the Normal Schools of New York State."

At the meeting of the Texas Teachers of Philosophy and Psychology, held in conjunction with the State Teachers Association at Dallas, November 29, Dr. L. W. Sackett, of the University of Texas, read a paper on the sequence of subjects in psychology, in connection with which he presented a chart showing the sequence of subjects and the number of pages devoted to each in fifteen of the leading textbooks of psychology. Professor J. Carleton Bell discussed "Class Experiments in Educational Psychology."

CURRENT PERIODICALS.

(In this section only such articles will be noticed as bear directly or indirectly upon the interests of this Journal.)

THE ELEMENTARY SCHOOL TEACHER. Vol. XIII, No. 5, January, 1913. GEORGE KOEPPEL. *Observations Concerning the Organization of Schools and Certain Phases of Educational Work in Germany. II. Special Help Schools.* 229-238. A clear and succinct account of the organization of auxiliary schools for backward and feeble-minded children in various parts of Germany. Pupils who are greatly behind their mates in school work are transferred to these special schools for economy of the time and strength of the regular teachers, and for efficiency in dealing with the backward pupils. The chief characteristics of these schools are a reduced course of study and special adaptation to the needs of the pupils. *III. Reform of School Systems.* 287-293. Deals with devices in German schools to take better account of the mental and physical capacities of individual pupils. The author describes the Sickinger plan at Mannheim and the continuation schools in Berlin.

No. 7, March, 1913. S. A. COURTIS. *The Reliability of Single Measurements with Standard Tests.* 326-345, 486-504. A reply to the criticisms of Otis and Davidson (noted in this JOURNAL, Vol. IV, p. 57). The variations in practice effect of twenty-five trials of the addition test are not due to change in readiness of association, but to other factors chiefly neuro-muscular. Averages of large groups show high correlation between test 7 and the sum of tests 1-4, but individual pupils may stand high in one and low in the other. In the first trial of a test the attention is more on the arithmetical phase of the work than in any subsequent trial. The articles present new material comparing the scores obtained in test 1 with scores in column addition. This shows wide individual variation in different types of column addition. The function, "ability to add," turns out, therefore, to be a highly complex affair, and calls for further study and analysis. On the pedagogical side we need more definite aims for our work in arithmetic, and we should have diagnostic tests to indicate the difficulties individual pupils have in attaining these aims.

SCHOOL REVIEW. Vol. XXI, No. 2, February, 1913. GUY WHEELER SHALLIES. *The Distribution of High School Graduates after Leaving School.* 81-91. The author tabulated the marks of 735 high school students who graduated from 75 high schools of New York State in 1908, and studied these marks with reference to the pupils' subsequent history. By far the largest group (34%)

entered college, and these pupils were distinctly above the average in class standing. The other groups, as normal school, professional school, teaching, business, trades, and home, draw their numbers largely from the middle and lower thirds.

Calvin N. Kendall. *The Training of High School Teachers.* 92-102. The demand for high school teachers is increasing faster than the supply, and the problem of their training grows acute. Four types of training are discussed, (1) academic training, in which colleges need closer touch with high schools, (2) special courses in education, to which we have to look more and more for the training of teachers, (3) the observation of teaching, which may be of great or of little value, depending upon the kind of teaching observed and the way in which the observations are acted upon, and (4) practice teaching under expert supervision, which is the most important and valuable of all.

No. 4, April, 1913. C. B. Robertson. *The Training of Secondary School Teachers.* 225-234. An account of the course for the professional training of high school teachers offered by the School of Education of the University of Pittsburgh. Special emphasis is laid upon the organization of the practice teaching. The plan would seem to be more elaborate and extended than that to be found in any other institution in this country.

Daniel Starch and Edward C. Elliott. *Reliability of Grading Work in Mathematics.* 254-259. A geometry examination paper written by a high school pupil was exactly reproduced, and a copy was sent to the head teacher in methematics in each of 180 high schools with the request that it be graded and returned. The marks on the 138 returns varied from 25 to 90. The authors make an interesting analysis of the variations, and point out the absurdity of assuming that teachers' evaluations of mathematical work will show greater agreement than their judgments in any other kind of work.

No. 5, May, 1913. Walter F. Dearborn. *The Practical Results of Recent Studies in Educational Statistics.* 297-306. Present educational practices should be evaluated before radical changes are made in educational procedure, and such evaluation calls for statistical treatment of data already available. The author reports the results of recent studies made under his direction comparing the class standing of the same pupils in the elementary school, in the high school, and in college. From these studies it would appear that pupils maintain in surprisingly large numbers the relative rank with which they began their school work. Changes due to school training do not overbalance differences in native mental ability. Such studies are of value in disclosing maladjustments of different stages of school work, and of different departments of study.

Stephen S. Colvin. *The Practical Results of Recent Studies in Educational Psychology.* 307-322. The teacher has a two-fold task. On the one hand it is incumbent upon him to secure the establish-

ment of certain habits, to mechanize certain mental processes, and to reduce the conscious direction of certain activities. On the other hand he must develop in the pupil the tendency and the ability to act in the light of reflective consciousness, rather than in terms of imitation and habit. Some educators condemn drill, but recent studies have shown its indispensable place. Requisites of good drill are careful preparation, variety in presentation, small number of new elements at each practice period, and a limited and carefully determined time of practice. In habit formation knowledge of the factors involved, favorable affective attitude, and objective standards of progress facilitate the desired results. Habits are largely specific and there is little transfer of training. Learning by wholes, short and frequent periods of study, memorizing by active recall, and singleness of purpose are important conditions of economical learning. In the higher thought processes the results of investigation are less definite, but some tentative conclusions may be advanced: (1) We think clearly only when confronted by a problem. (2) A negative command is more apt to arouse reflection than a positive one. (3) A check or shock to the habitual flow of ideas serves to awaken more vital imagery. (4) A problem not only arouses thought but determines the direction of the trend of thought. (5) In developing intellectual and emotinal attitudes the art of questioning is of vital importance. (6) The teacher should endeavor to maintain an attitude of reasonable self-criticism.

Ernest C. Moore. *Improvement in Educational Practice.* 323-333. An appeal for better-trained teachers, a broader outlook upon the problems of teaching, a more careful study of the mental attitudes of pupils, and a better adaptation of methds to individual needs.

PUBLICATIONS RECEIVED.

ADELA MARION ADAM. *Plato. Moral and Political Ideals.* Cambridge Manuals of Science and Literature. New York: G. P. Putnam's Sons, 1913. Pp. viii, 159. Forty cents, net.

An attempt to trace the development of Plato's moral and political ideals through their various stages,—"a clear account, intelligible to the plain man, of what Plato did in the moral and political sphere."

GUSTAV ASCHAFFENBURG. *Crime and Its Repression.* Translated from the German by Adalbert Albrecht. The Modern Criminal Science Series. Boston: Little, Brown & Co., 1913. Pp. xxviii, 331. $4.00 net.

"In its thoroughly realistic application of social statistics to the theories of criminal law, this work occupies a place of almost unique importance in the literature of criminal science. It presents an original treatment of the entire subject—the Repression of Crime—which may well serve some day as a model for a work based on American statistics,—if reliable ones shall ever become available."

RICHMOND L. BISHOP. *The Philosophy of Natural Science.* Boston: The Christopher Press, 1913. Pp. 87.

So far as one may discover from this book the author knows little of philosophy and less of natural science. The book seems to be written to promulgate a particularly crass type of mental healing, and abounds in such statements as the following: "The concordant atmosphere of mind to mind operates upon the natural law of like attractions, or the positive element as master of the negative temperament."

C. S. BLEUMEL. *Stammering and Cognate Defects of Speech.* Volume I. *The Psychology of Stammering.* Pp. x, 365. Volume II. *Contemporaneous Systems of Treating Stammering.* Pp. v, 391. New York: G. E. Stechert & Co., 1913. $5.00 net.

It is interesting to note how needs that are widely felt in the scientific world exert their quiet but steady pressure upon thoughtful students until the method of satisfying these needs ripens in the minds of several individuals at about the same time. There has long been a need in English for a scientific treatment of speech defects, and within a year we are offered two excellent treatises on the sub-

ject,—one from the pen of a noted student of experimental phonetics, and the other the present imposing work. Volume I deals with mental types, verbal imagery, the neural basis of speech, the part played by mental imagery in voluntary speech, aphasia, theories of stammering, mental confusion in stammering, and the effect of fear and auto-suggestion upon speech. Chapter seven is especially valuable, for in it the author presents a careful historical survey of the various theories that have been offered for stammering, and develops his own view on the basis of laboratory and questionnaire studies. Volume II gives a digest of the principal systems and methods of treatingg stammering with a critical evaluation of their claims considered from a psychological point of view. The work is scientific, comprehensive, and unbiased, and merits a place in the library of every student of language and of every teacher of oral English.

B. R. Buckingham, Ph.D. *Spelling Ability: Its Measurement and Distribution.* New York: Teachers College, 1913. Pp. 116. $1.25.

This monograph presents an interesting attempt to establish a scale for the measurement of spelling ability, similar to that devised by Thorndike for handwriting and Hillegas for English composition. From a list of five thousand words, each common to two or more spelling books, two hundred and seventy words were selected, in such a way that all were sufficiently common to be in the speaking vocabulary of third grade children, and that most gave enough difficulty in spelling to test the ability of eighth-grade children. From this "Original List" a "Selected List" of one hundred words was chosen according to the percentages of correct spellings in each of the grades, and from this "Selected List" two "Preferred Lists" of twenty-five words each were constructed. In all 8791 children were tested, and the results were arranged on a scale in such a way as to indicate degrees of difficulty and the difference by which one word is more difficult than another. A practical result of the study is to bring to light the fact that there is great lack of knowledge on the part of principals and teachers as to what words are hard and what are easy for children. This in itself may account in large measure for much of our trouble in the teaching of spelling.

George Rowland Dodson, Ph.D. *Bergson and the Modern Spirit.* Boston: American Unitarian Association, 1913. Pp. 296. $1.35 net.

In this interpretation of Bergson's philosophy for the average man the author shows a broad grasp of modern movements in biology, psychology, sociology, and education, and a commendable freedom from theological bias. He is in full sympathy with the endeavor to

work out a system of ethical and religious views which will not be in conflict with scientific thinking, and points to Bergson for the philosophical basis of such a system. The book is one of the sanest and most temperate applications of Bergson that has yet appeared.

FRANCISCO FERRER. *The Origin and Ideals of the Modern School.* New York: G. P. Putnam's Sons, 1913. Pp. xiv, 147. $1.00 net.

The proverb, "The blood of the martyrs is the seed of the church," rests upon a profound principle of human nature, and it is no less true of the blood of those martyred by the Church. We do not know how Francisco Ferrer is esteemed in Spain today, but it is certain that his name would never have had the distinction which is awarded to it throughout the civilized world if it had not been for his execution for the sake of an idea. Even the Spanish Government has now recognized that it killed an innocent man, and has ordered the restoration of his property to his heirs. The things for which Ferrer stood and the reasons for his persecution by the authorities are naively set forth in this little book, the manuscript of which was found among his effects. It should be widely read by those who are interested in contemporary movements in education.

I. E. FINKELSTEIN, A.M. *The Marking System in Theory and Practice.* Educational Psychology Monographs, No. 10. Baltimore: Warwick and York, 1913. Pp. 88. $1.00.

An interesting study of the range of marks in Cornell University. The book contains six tables and twenty-nine charts, which present in graphic form the range of marks in different schools and departments, and in different courses in the same school. Typical distributions taken from high markers and low markers show no similarity whatsoever. The author recommends a five-division marking system with an approximation to the following distribution: Excellent, 3 per cent.; superior, 21 per cent.; medium, 45 per cent.; inferior, 19 per cent.; very poor, 12 per cent.

EBEN W. FISKE. *An Elementary Study of the Brain.* New York: The Macmillan Company, 1913. Pp. vii, 133. $1.25 net.

This is a laboratory manual on the dissection of the sheep's brain, with an introduction on the phylogeny of the brain and a summary in which applications are made to the human brain. It is the hope of the author to smooth the student's path in his approach to this difficult and complicated subject, and to arouse in him such an interest in neurology that he will be anxious to continue the subject and engage in neurological research. The book contains many splendid photographic plates, and a large number of illustrative diagrams.

ABRAHAM FLEXNER. *Medical Education in the United States and Canada.* Bulletin No. 4. New York: Carnegie Foundation for the Advancement of Teaching. 1910. Pp. xvii, 326.

ABRAHAM FLEXNER. *Medical Education in Europe.* Bulletin No. 6. New York: Carnegie Foundation for the Advancement of Teaching. 1912. Pp. xx, 357.

These two monographs furnish the best survey of the present status of medical education that can be had. The monograph on medical education in America revealed the great excess of poorly equipped, struggling schools, founded for purely commercial reasons or in connection with small colleges, and hindering rather than helping the medical profession and the public health. It has already brought about the abandonment of many weak schools, and the amalgamation of others with stronger institutions. The contrast afforded by medical education in Europe is a striking one, and worthy of the reflection of all who are interested in the broader aspects of education.

CHARLES D. FOX. *The Psychopathology of Hysteria.* Boston: Richard G. Badger, 1913. Pp. 437. $2.00 net.

The author gives a complete survey of the major symptoms of hysteria, including disturbances of sense perception, visceral and circulatory derangements, psycho-motor disorders, psycholepsy, alterations of consciousness, multiple personality, amnesia, suggestibility, delusions, and insanity, and discusses the theories that have been offered to account for the disease. The prophylaxis of hysteria according to the author is little more than a sane and well-balanced education.

SIDONIE MATZNER GRUENBERG. *Your Child Today and Tomorrow.* Philadelphia: J. B. Lippincott Co., 1913. Pp. 234. $1.25 net.

Most parents want to do the right thing by their children, but they are too much occupied with other things to have the time to properly inform themselves on the studies that have been made of child nature, and too impatient and thoughtless to make systematic studies themselves. The present book sets forth in attractive form what the author has learned from books and gathered from her own observation in regard to the training of children. The chapters take up such topics as the problem of punishment, flights of the imagination, lying, fears, the law of obedience, training the will, how children reason, work and play, children's gangs and clubs, ideals and ambitions, the truth about reproduction, and the part that heredity and environment play in development.

W. N. Bailmann. *The Elementary Industrial School of Cleveland, Ohio.* Bulletin No. 549. Washington: Bureau of Education, 1913. Pp. 19.

"We need for professional ends and for purposes of general culture much, if not all, of what the school of the usual sort holds high in its tradition. But, in addition to these things or, perchance, in the place of certain phases of them and in different form and distribution, we need . . . . . opportunity and guidance in the development of constructive, inventive, and creative skill and genius in the fields of activity, in which alone the best of each of them can become available."

Carl Hartman and Lewis Bradley Bibb. *First Book of Health.* Yonkers-on-Hudson: World Book Co., 1913. Pp. iv, 155. Thirty-five cents.

It is a matter for congratulation that so much emphasis is being laid upon health and its preservation, and that health teaching is included in the curriculum of each grade. No other subject is at once so practical and so cultural. It is fortunate that young children in the lower grades have such a simple and interesting account of the elements of physiology and hygiene offered them, and that their text is so richly and helpfully illustrated. The quality of paper and the amount of space allowed for chapter headings might have been improved.

Arthur Holmes, Ph.D. *Principles of Character Making.* Philadelphia: J. B. Lippincott, 1913. Pp. 336. $1.25 net.

This is an attempt to apply psychology in its modernized form to the most vital function of the home and the school. Character has its roots deep down in the inherited constitution of the individual, and any thorough study of character making must begin with heredity. The first five chapters of the book, therefore, deal with the psychological and biological bases of character, discussing the nature of character, the attitude of modern psychology toward character, the sources of character, the development of heredity character, and the instincts. But original traits undergo modification in play and habit formation, and the function of each of these in character making receive attention. But character is dependent upon the nature of higher controls, and upon the way in which these controls function in the responses of the individual. Hence we have chapters on the self, the will, the impulses and ideals of youth, and the essence of good character. Finally, by way of a summary of the whole matter, there is a chapter on the psychological basis of moral education.

CHARLES HOOLE. *A New Discovery of the Old Art of Teaching School.* Copied from manuscript in the British Library, with Introduction and Notes by Thistleton Mark. Syracuse, N. Y.: C. W. Bardeen, 1912. Pp. xxxviii, 360. $3.00.

This interesting book gives an excellent picture of English educational theory and practice three hundred years ago. It consists of four treatises, (1) "A Petty School", (2) "The Usher's Duty", (3) "The Master's Method", (4) "Scholastic Discipline". Hoole was perhaps the most painstaking of all the English educational writers of his time, and it is noteworthy that, while the greatest emphasis is laid upon the languages, as Latin, Greek, Hebrew, Chaldee, Arabic, etc., a course was provided for those who did not wish to take up Latin. This was the "Writing Schools" where the pupils were to be taught to keep up their English, to write a fair hand, and afterwards to be exercised in arithmetic and "such preparative arts as may make them completely fit to undergoe any ordinary calling." Great credit is due the publisher for making this work accessible to modern students of education.

THOMAS JOSEPH KIRBY, Ph.D. *Practice in the Case of School Children.* New York: Teachers College, 1913. Pp. 98. $1.00.

A study of the results of practice in arithmetic with 1350 third and fourth-year children in the schools of the Children's Aid Society, New York City. Two sets of practice tests were used, one in addition, the other in division. Various practice periods from two to twenty minutes were employed, and the effect of each distribution of time carefully noted. In both addition and division the greatest gains were made by the groups which had their practice in the shortest periods. After an interval of 12 days there was very little loss in the records of those who had improved 50 per cent. or more, but the summer vacation brought a very considerable loss in both addition and division.

EDWIN GORDON LAWRENCE. *How to Master the Spoken Word.* Chicago: A. C. McClurg & Co., 1913. Pp. ix, 420. $1.50 net.

This book deals with correct breathing, proper voice production, the adequate expression of meanings, improvement of memory, fluency of speech, control of an audience, and the construction of speeches. A considerable part of the book (230 pages) is devoted to extracts from Greek, Latin, and modern orators.

ALBERT H. LEAKE. *Industrial Education, its Problems, Methods, and Dangers.* Boston: Houghton-Mifflin Co., 1913. Pp. xi, 205. $1.25 net.

This volume, by the inspector of technical education in Ontario,

Canada, won the Hart, Schaffner and Marx prize for essays in economics in 1912. Part I gives a brief sketch of the history of industrial education, and develops the problems which are involved in its various aspects. Part II discusses the methods of industrial education, taking up the curriculum and work of the elementary schools, manual training and its needed reorganization, new types of industrial schools, day and evening continuation schools, apprenticeship, and vocational guidance. Part III presents a consideration of some dangers arising from the misinterpretation of foreign systems and their indiscriminate application to American conditions. The book is one of the most scholarly discussions of the subject that is available in English.

C. Riborg Mann. *The Teaching of Physics for Purposes of General Education.* New York: The Macmillan Co., 1912. Pp. xxv, 304. $1.25.

"The book is divided into three main parts. The first of these traces the development of the present situation. The second traces the origin of physics, and seeks to establish its leading characteristics and to define its possibilities as a means of general education. In the third part the purpose of physics teaching is stated, and hints are given as to how this purpose may be attained." In the last chapter, on testing results, the author advocates the development and use of such scientific tests as have been worked out for arithmetic, handwriting, and English composition, and as have been recently perfected for spelling.

Frances Jenkins Olcott. *The Children's Reading.* Boston: Houghton Mifflin Co., 1912. Pp. x, 344. $1.25 net.

An excellent survey of the entire field of juvenile literature by the former head of the children's department at the Carnegie Library in Pittsburgh. Among the topics considered in the various chapters are picture books and illustrations; easy reading for young people; fables, myths and fairy tales; ballads, epics and romances; poetry and rhymes; some classics and standards; fiction of today; history, biography and travel; useful books; and religious books. Each chapter contains a discussion of the most important books in the class, and the reasons for considering them of value. Many programs of consecutive reading are outlined. The appendix contains One Hundred Good Stories to Tell, and Where to Find Them, and an alphabetical purchase list of about 800 of the best books for children. The volume will be of great value to teachers and parents in recommending books for their children, and deserves to be widely known and studied.

JOSEPHINE MORRIS. *Household Science and Arts.* Cincinnati: The American Book Co., 1913. Pp. 256.

The author, who is supervisor of household science and arts in the Boston Public Schools, here offers a book for use in the elementary schools that emphasizes clean and sanitary kitchens, adequate kitchen equipment, and the preparation of simple and wholesome food. The illustrations in color are quite attractive and should familiarize pupils with the names for the various cuts of meat.

H. J. MOZANS. *Woman in Science.* New York: D. Appleton & Co., 1913. Pp. xiii, 452. $2.50 net.

The first chapter of this book deals with "Woman's Long Struggle for Things of the Mind", and requires over one hundred pages for the development of the story. In the subsequent chapters the separate fields of science are taken up, and there is a detailed exposition of woman's activities in mathematics, astronomy, physics, chemistry, the biological sciences, medicine and surgery, archaeology and invention. The final chapter considers the future of women in science, and claims for them a considerable share in the advancement of human thought. The book is a scholarly one, and in view of the violent disputes aroused by the feminist movement its appearance is very timely.

RAYMOND W. SIES. *Teachers' Pension Systems in Great Britain.* Bulletin No. 544. Washington: Bureau of Education, 1913. Pp. 88.

One section of a general study of teachers' pensions and pension systems in the leading educational countries of the world.

G. F. WRENCH. *Lord Lister, His Life and Work.* New York: Frederick A. Stokes Co., 1913. Pp. 384. $4.50 net.

One cannot repress a shudder on reading the grewsome results of surgical operations a half century ago,—the loathsome gangrene, the fatal blood poisoning, the hopeless outlook for the patient when any sort of major operation had to be performed. Then came Pasteur with his discovery of the cause of this supporation, the germs found in the dust of the air, and Lister with his aseptic treatment of wounds, and the whole practice of surgery was revolutionized. But before this was brought about, however, Lister had to carry on a long and bitter fight with the entrenched forces of traditional surgical practice, and the story of that fight is graphically portrayed in this book. It is a bit of modern history that should be widely taught in the schools, in order that intelligent men and women may maintain a saner attitude toward the vagaries of faith healing that so abound.

DAVID SNEDDEN. *Problems of Educational Adjustment.* Boston: Houghton Mifflin Co., 1913. Pp. ix, 262. $1.50 net.

This collection of papers, all of which have appeared before in various educational magazines, constitutes another attack upon "things as they are" in education,—an attack by one of the most careful students of the whole field of educational activity, both in its theoretical and in its practical aspects. Of particular value are the first four papers, which deal with the new education and educational readjustment, the new basis of method, what is a liberal education, and why study history?

HENRY SUZZALLO. *The Teaching of Spelling.* Boston: Houghton Mifflin Co., 1913. Pp. xii, 129. Sixty cents, net.

"Up to twenty years ago the characteristic activities of the spelling period were a mere examination of the child's ability to spell and a drilling upon the correct form of misspelled words. Within the last decade the prevention of error, rather than the testing and noting of errors, has become the major activity. Apparently we are now about to devote an increased energy and ingenuity to the weakest spot in the spelling lesson,—the correction of misspellings. We are ready to develop a technique which will adequately correct those misspellings which escape all the anticipatory efforts of our best teachers. It is in the diagnosis of spelling errors and in the skillful substitution of new and correct habits that we shall find our largest immediate opportunity for improving our methods of teaching spelling."

R. M. WENLEY. *The Anarchist Ideal.* Boston: Richard G. Badger, 1913. Pp. 274. $1.25.

"This book consists of five studies: The Anarchist Ideal; Plutarch and his Age; The Progress toward Physiological Psychology; Heredity and Education: Some Facts and Some Guesses; and the University in the United States. These essays, while appealing to the teacher and to the psychologist, have an equally direct message for the American citizen interested in contemporary movements and institutions in the United States."

HENRY SUZZALLO. *The Teaching of Primary Arithmetic.* Boston: Houghton Mifflin Co., 1913. Pp. xi, 124. Sixty cents net.

A survey of current methods of teaching primary arithmetic, and an analysis of present tendencies in method. The various methods are objectively considered, and there is little of the "thou shalt" and "thou shalt not" in the discussion. The treatment takes full account of the modern experimental point of view in studies of method, and the author urges further studies in the psychology of number.

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